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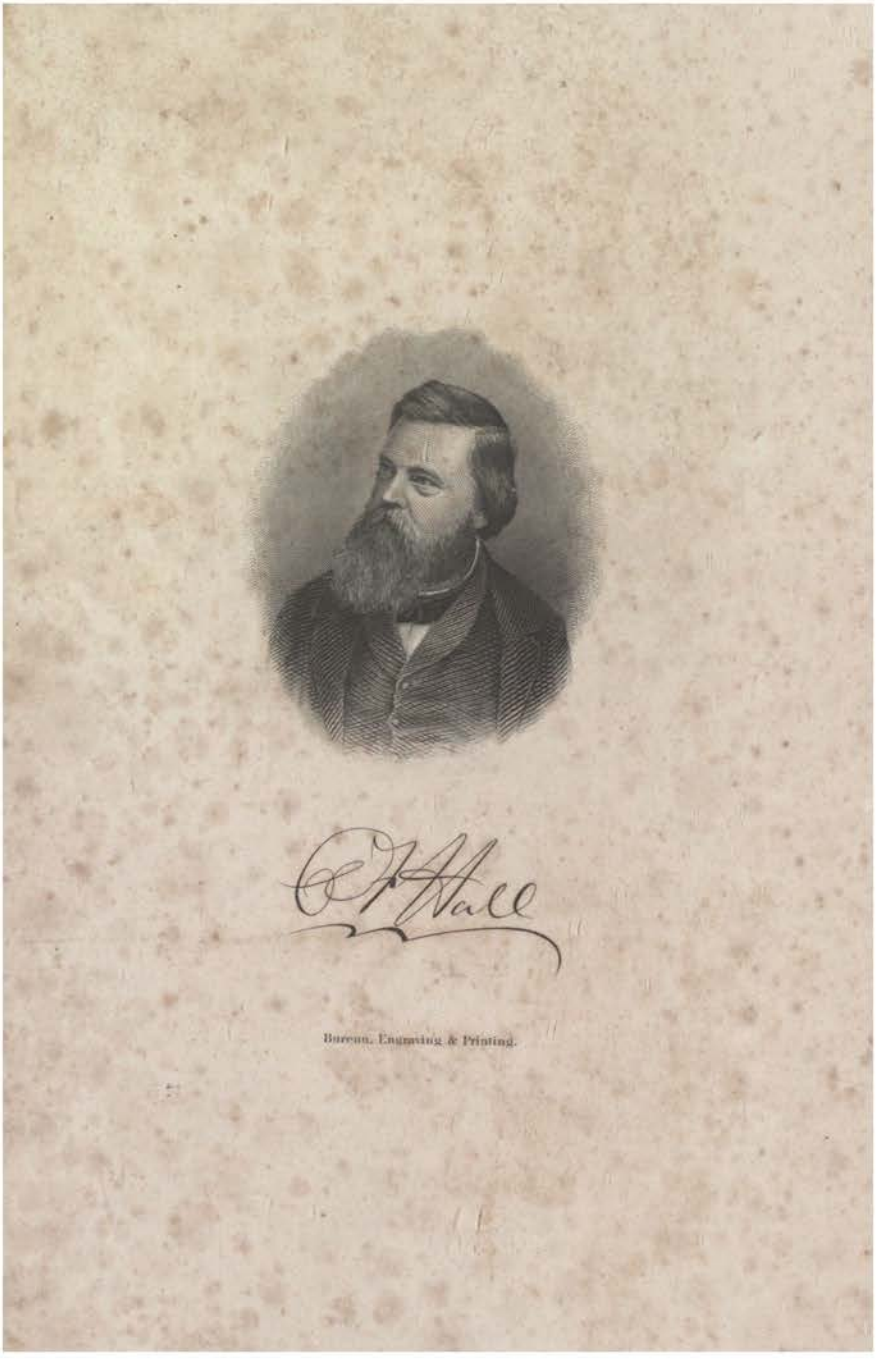

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U. S. S. Polaris. *C. F. Hall, Commander.*

May 31st 1871.

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NARRATIVE

OF THE

NORTH POLAR EXPEDITION.

U. S. SHIP POLARIS,

CAPTAIN CHARLES FRANCIS HALL COMMANDING.

EDITED UNDER THE DIRECTION OF THE

HON. G. M. ROBESON,

SECRETARY OF THE NAVY,

BY

REAR-ADMIRAL C. H. DAVIS, U. S. N.

85191

U. S. NAVAL OBSERVATORY,

1876.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

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This narrative has been prepared from official papers and from journals of the officers and men of the Expedition, as well as from valuable private contributions acknowledged in the text. The thread of the story of the Polaris has been drawn chiefly from a compilation made by Mr. R. W. D. Bryan, the Astronomer of the Expedition; the incidents of the ice-floe party have been furnished by the journals and note-books of Geo. E. Tyson, Assistant Navigator, and of others with him on the floe, and by the testimony given before the board organized by the Secretary of the Navy, June 5, 1873.

NOTE.

The final revision and proof-correction of Chapters XIX to XXV having been entrusted to me by Admiral Davis at the time of his failing health, I have endeavored to present this part of the Narrative with the accuracy which he would have approved.

J. E. NOURSE,
Profr. U. S. N.

U. S. NAVAL OBSERVATORY, *March* 30, 1877.

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[Designed and drawn by Lieutenant Commander C. H. Davis, U. S. N.]

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[Executed at the Bureau of Engraving, United States Treasury Department.]

Portrait of Hall, (from a photograph taken in 1863) ..... Frontispiece.

Vignette of the Polaris, (from a photograph taken at the Washington navy-yard) ..... Frontispiece.

WOOD ENGRAVINGS.

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[As no records of surveys were brought back by the Expedition, the maps of the new lands discovered are necessarily imperfect. The coast-line was laid down as accurately as possible, after all the members of the Expedition had been examined and their diverse testimony carefully compared. It may be said that the coast-lines north of the 82d parallel are apocryphal. Captain Hall's estimate (see page 165) of the latitude of the most northern land, clearly seen, is perhaps nearer the truth.]

Track of the Polaris While Beset 414

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[This map was taken from the report of the Secretary of the Navy for 1873.]

INTRODUCTION.

ERRATA.

Page 17, for J. C. Cist read L. J. Cist.
Page 50, for Stark read Starick.
Page 50, for Freiderickstadt read Friedrichsthal.
Page 190, for Parry read Kellett.
Page 191, for Mr. Miles Greenwood, and Mr. R. M. Bishop, of New York, read ——— of Cincinnati.
Page 357, for 11 p. m. read 11 a. m.
Page 361, for boat read load.

INTRODUCTION.

It appears from the letters and papers of Captain Hall, purchased by the Government from his widow and now in possession of the Navy Department, that the expedition of the Polaris to the Arctic regions originated with him and was carried into execution according to his own plans.

During two prolonged residences among the Esquimaux—a period, to use his own language, of "about eight years"—he repeatedly speaks of his desire and purpose to lead such an expedition. Indeed, as far back as the beginning of the year 1863, in a letter written to Mr. J. C. Cist, of Saint Louis, shortly after his return from his first expedition, he says: "My third voyage to the Arctic regions will be (D. V.) for discovery, to the northern axis of the great globe." This resolution he steadily maintained until the opportunity presented itself for carrying it into execution.

In order to show this more fully, and to furnish at the same time the means of making a just estimate of his character and purpose, the following extracts are given from his journal:

"*April* 14, 1865.—We are nearly all ready for the proposed removal. North, *north*, farther and farther NORTH, I long to get. Though the locality of King William's Land is all I aspire to on this present journey, yet I never will be satisfied in voyaging and traveling in the Arctic regions until I shall reach that spot of this great and glorious orb of God's creation where there is no North, no East, no West. Of course, that mundane point is the one nearly under *Polaris*."

"*March* 4, 1866.—The end will soon be, I trust, when I shall have done what I came to this country to do, and then may God grant me the opportunity and the *proper* means to make my way to the *north extreme* of His glorious earth."

"*February* 16, 1869.—I must *(Deo volente)* do up all my work for which I came into this country this spring and coming summer, for I long to return to America, to prepare at once for my expedition to the North Pole. Night and day, day and night, weeks, months, and years, find my heart and purposes fixed, without a shadow of wavering, on making that voyage. *May Heaven spare my life to perform it.*"

The following extract is from a letter written in 1869 to Mr. A. B. Johnson, president of the Teachers' Institute of Hamilton County, Ohio, on accepting an invitation to lecture before the Institute:

"Although the primary object of my voyages to the North has not been for geography, yet I have been enabled to make considerable advance in geographical discoveries. There is a great sad blot upon the present age, which ought to be wiped out, and this is the blank on our maps and artificial globes from about the parallel of 80° North up to the North Pole. I, for one, hang my head in shame, when I think how many thousands of years ago it was that God gave to man this beautiful world—the whole of it—to subdue, and yet that part of it which must be most interesting and glorious, at least so to me, remains as unknown to us as though it had never been created. Having now completed my Arctic collegiate education, I feel to spend my life in extending our knowledge of the earth up to that spot which is directly under Polaris—the crowning jewel of the Arctic dome. I hope to start on my next voyage next spring. Shortly, I expect to apply to our Government for its aid, feeling that the day has come when the great problem of ages on ages must be solved under the stars and stripes."

March 29, 1870, he writes to the Senate Committee on Foreign Relations:

"For years I have had it in my mind that when I should complete the mission relative to Sir John Franklin's expedition—that is, should recover some of Franklin's companions, or should become satisfied that none existed—I would return to my country and prepare for making a third voyage to the Arctic regions, especially for making geographical discoveries, even up to the north extremity of the axis of our globe. * * * * * * Neither glory nor money has caused me to devote my very life and soul to Arctic exploration."

These quotations are given precisely in the form and language in which they were written. Hall had expressed himself in like terms to that fast friend of this, as of previous Arctic explorations, Mr. Henry Grinnell of New York City, writing to him from Washington on the 8th of March, 1870, thus: "In three to five years, I doubt not, with the same aid and protection of high Heaven as on my two previous Arctic voyages, I would fully accomplish the determination of my burning soul, which determination, my dear Mr. Grinnell, you know to be to put my foot on the north extremity of the axis of the globe."

Thus it appears that Captain Hall, in single-minded devotion to the cause of Arctic exploration, is worthy to be placed by the side of Parry, Franklin, and Kane. This devotion was not merely a sentiment; on the contrary, during his long residence among the Esquimaux, his constant aim was to qualify himself for this service by adopting, throughout, the Esquimaux mode of life; by habituating himself to their manners and customs; and by acquiring a practical knowledge of the geography of the Arctic regions and of the native mode of traveling. On his return from this region in 1869, he immediately began, by lecturing in various parts of the United States, to mature a public opinion favorable to his enterprise. After lecturing in New York, Brooklyn, Pittsburgh, Cincinnati, and several other cities as far west as Indianapolis, he went to Washington and commenced those efforts which terminated successfully in procuring the appropriation granted by Congress for the Polaris Expedition.

CHAPTER I.

Captain Hall arrived in Washington January 30, 1870. 1870. A few days after his arrival he called on the President of the United States, who manifested so great an interest in the proposed Arctic researches as to draw from Hall a statement of his life and experiences among the Esquimaux. Hall was strongly impressed not only by the President's sympathy and kindness but also by the knowledge he displayed of the whole field of Arctic exploration.

It may be stated here, once for all, that the authority for everything relating to Hall, personally, is derived from his correspondence chiefly addressed to the late Mr. Henry Grinnell of New York, and to Mr. J. Carson Brevoort of Brooklyn.

On the 2d of March he accepted an invitation to lecture on his "Arctic Expeditions, Past and Prospective," signed by the Vice-President, by members of the Cabinet, Senators, Representatives, and citizens of Wash-

1870. ington. This lecture, delivered March 5th in Lincoln Hall, was attended by the President and by many distinguished citizens in public and private life, who manifested a deep interest in Captain Hall's work.

In a private letter to his friend, Mr. Grinnell, he speaks of this fact with feeling, and dwells particularly on the marks of approbation which the mention of the appropriation for the proposed expedition elicited. The historical part of this lecture, illustrated by maps and charts, related chiefly to the expedition of Franklin, and the fate of his officers and men. Next to this, that which most engaged the attention of the audience was a full description of Esquimaux habits and life, domestic and nomadic, in all particulars; exemplified, to some extent by the natives Ebierbing (*Joe*), and Tookolitoo (*Hannah*), his wife, who were present with their child Punny (*Sylvia*).

On the 8th of March, 1870, a joint resolution relative to a voyage to the Arctic regions was introduced in the House of Representatives by Hon. J. Stevenson, of Ohio, which, after having been read a second time, was referred to the Committee on Appropriations. This committee had been already prepared for the subject by memorials proceeding from distinguished sources in various parts of the country.

On the 25th of March, 1870, Hon. John Sherman, of Ohio, obtained the unanimous consent of the Senate to

bring in a similar resolution; which was read twice and referred to the Committee on Foreign Relations. On the 19th of April Hon. Charles Sumner, chairman of that committee, reported the resolution with amendments; and on the 23d of May Mr. Sumner introduced the amended resolution as an amendment to the general appropriation bill. Upon its adoption the Senate was equally divided; Vice-President Colfax secured it by his casting vote. On the 9th of July the House of Representatives agreed to the amendment, provided that the sum of $50,000 was inserted in the place of $100,000; in which amendment the Senate the same day concurred. **1870.**

The appropriation finally passed in the following terms, (sec. 9 of the Legislative, Executive, and Judicial Appropriation bill:)

"*Be it enacted,* That the President of the United States be authorized to organize and send out one or more expeditions toward the North Pole, and to appoint such person or persons as he may deem most fitted to the command thereof; to detail any officer of the public service to take part in the same, and to use any public vessel that may be suitable for the purpose; the scientific operations of the expeditions to be prescribed in accordance with the advice of the National Academy of Sciences; and that the sum of fifty thousand dollars, or such part thereof as may be necessary, be hereby appropriated, out of any

1870. moneys in the Treasury not otherwise appropriated, to be expended under the direction of the President."

The act was approved by the President, July 12, at which time the actual history of this expedition begins.

Eight days after its approval the President of the United States issued to Captain Hall the following commission appointing him commander of the expedition toward the North Pole:

"EXECUTIVE MANSION,

"*Washington, D. C., July* 20, 1870.

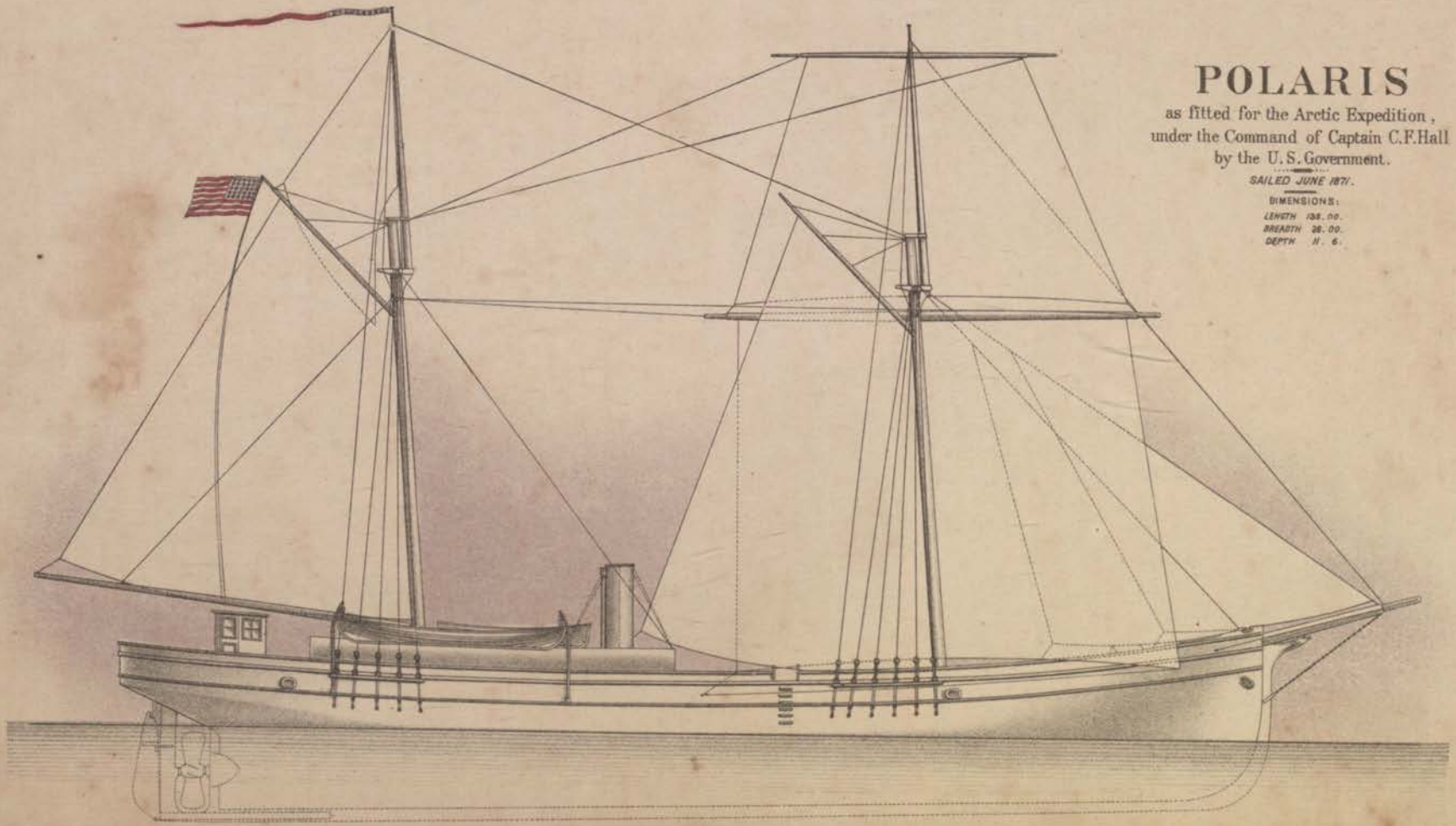
"DEAR SIR: You are hereby appointed to command the expedition toward the North Pole, to be organized and sent out pursuant to an act of Congress approved July 12, 1870, and will report to the Secretary of the Navy and the Secretary of the Interior for detailed instructions.

"U. S. GRANT.

"Capt. C. F. HALL."

The President also sanctioned the selection by the Secretary of the Navy of a vessel suitable for the purpose. The United States Steamer Periwinkle, fourth-rate, a staunch tug of 387 tons burden, was selected.

In order to qualify her for the service, she was hauled up on the ways at the Washington navy-yard; her wales, planking, clamps, and ceiling were removed, and



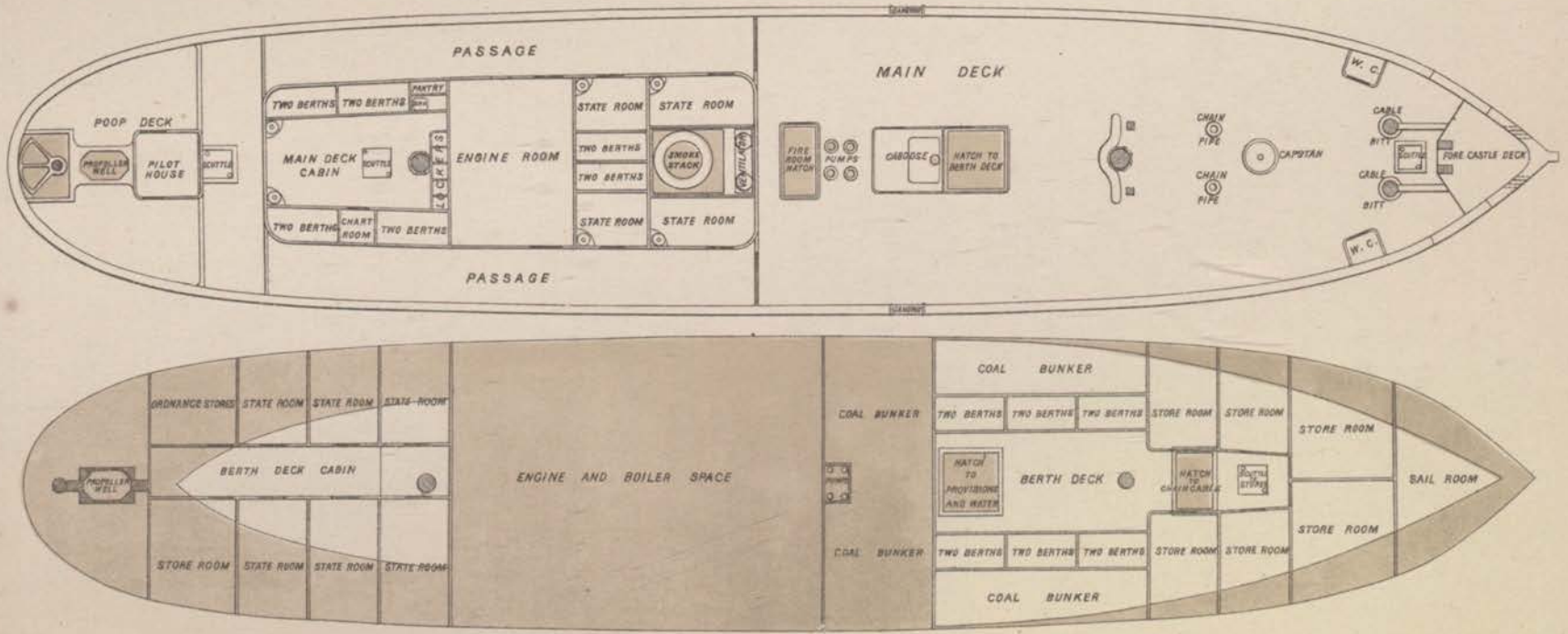
POLARIS

as fitted for the Arctic Expedition,
under the Command of Captain C.F.Hall
by the U.S.Government.

SAILED JUNE 1871.

DIMENSIONS:

LENGTH 134.00.
BREADTH 26.00.
DEPTH H. 6.


POOP DECK
PROPELLER WELL
PILOT HOUSE
BINNACLE
PASSAGE
TWO BERTHS
TWO BERTHS
PANTRY
MAIN DECK CABIN
SKYLIGHTS
ENGINE ROOM
STATE ROOM
STATE ROOM
TWO BERTHS
TWO BERTHS
SMOKE STACK
VENTILATOR
TWO BERTHS
CHART ROOM
TWO BERTHS
STATE ROOM
STATE ROOM
PASSAGE
MAIN DECK
FIRE ROOM HATCH
PUMPS
CABOOSE
HATCH TO BERTH DECK
CHAIN PIPE
CAPSTAN
CHAIN PIPE
W. C.
CABLE
BITT
BINNACLE
FORE CASTLE DECK
CABLE
BITT
W. C.
ORDNANCE STORES
STATE ROOM
STATE ROOM
STATE ROOM
PROPELLER WELL
BERTH DECK CABIN
STORE ROOM
STATE ROOM
STATE ROOM
STATE ROOM
ENGINE AND BOILER SPACE
COAL BUNKER
COAL BUNKER
COAL BUNKER
TWO BERTHS
TWO BERTHS
TWO BERTHS
HATCH TO PROVISIONS AND WATER
BERTH DECK
TWO BERTHS
TWO BERTHS
TWO BERTHS
COAL BUNKER
STORE ROOM
STORE ROOM
HATCH TO CHAIN CABLE
BINNACLE
STORE ROOM
STORE ROOM
STORE ROOM
STORE ROOM
SAIL ROOM

her decks were taken out. She was newly and heavily timbered and her depth increased, making the vessel about 400 tons. She was newly planked inside and out, new deck-beams of increased size were put in, and new planking was given her. The bottom was thoroughly calked, then double-planked, calked, and coppered. New bulkheads and inboard works, new spars, rigging, sails, and boats were added. The propeller-well and shoe were protected against accident, and all of the fittings were made as required to meet any contingencies which might arise during the perilous voyage. Everything deemed necessary for safety and comfort was done to the vessel which professional skill could suggest. No vessel, even if especially built, could have been better adapted to the service than the Periwinkle. **1871.**

The Periwinkle, thus rebuilt, was launched at the Washington navy-yard April 25, 1871, and named the Polaris by her future commander, under his sanguine expectation of the fullest success.

On the 31st of May, the President of the United States, the Secretary of the Navy, and other high officers of the Government, inspected the vessel and were entertained by her commander.

She sailed from Washington June 10, 1871, under the following instructions:

1871. "NAVY DEPARTMENT, *June* 9, 1871.

"SIR: Having been appointed, by the President of the United States, commander of the expedition toward the North Pole, and the steamer Polaris having been fitted, equipped, provisioned, and assigned for the purpose, you are placed in command of the said vessel, her officers and crew, for the purposes of the said expedition. Having taken command, you will proceed in the vessel, at the earliest possible date, from the navy-yard in this city to New York. From New York you will proceed to the first favorable port you are able to make on the west coast of Greenland, stopping, if you deem it desirable, at St. John, Newfoundland. From the first port made by you on the west coast of Greenland, if farther south than Holsteinborg, you will proceed to that port, and thence to Godhavn, (or Lievely), in the island of Disco. At some one of the ports above referred to you will probably meet a transport, sent by the Department, with additional coal and stores, from which you will supply yourself to the fullest carrying capacity of the Polaris. Should you fall in with the transport before making either of the ports aforesaid, or should you obtain information of her being at, or having landed her stores at, any port south of the island of Disco, you will at once proceed to put yourself in communication with the commander of the transport, and supply yourself with the additional stores and coal, taking such

"measures as may be most expedient and convenient for that purpose. Should you not hear of the transport before reaching Holsteinborg, you will remain at that port, waiting for her and your supplies, as long as the object of your expedition will permit you to delay for that purpose. After waiting as long as is safe, under all the circumstances as they may present themselves, you will, if you do not hear of the transport, proceed to Disco, as above provided. At Disco, if you hear nothing of the transport, you will, after waiting as long as you deem it safe, supply yourself, as far as you may be able, with such supplies and articles as you may need, and proceed on your expedition without further delay. From Disco you will proceed to Upernavik. At these two last-named places you will procure dogs and other Arctic outfits. If you think it of advantage for the purpose of obtaining dogs, &c., to stop at Tossak, you will do so. From Upernavik, or Tossak, as the case may be, you will proceed across Melville Bay to Cape Dudley Digges, and thence you will make all possible progress, with vessels, boats, and sledges, toward the North Pole, using your own judgment as to the route or routes to be pursued and the locality for each winter's quarters. Having been provisioned and equipped for two and a half years, you will pursue your explorations for that period; but should the object of the expedition require it, you will continue your explorations to such a fur- **1871.**

1871. "ther length of time as your supplies may be safely extended. Should, however, the main object of the expedition, viz., attaining the position of the North Pole, be accomplished at an earlier period, you will return to the United States with all convenient dispatch.

"There being attached to the expedition a scientific department, its operations are prescribed in accordance with the advice of the National Academy of Sciences, as required by the law. Agreeably to this advice, the charge and direction of the scientific operations will be intrusted, under your command, to Dr. Emil Bessels; and you will render Dr. Bessels and his assistants all such facilities and aids as may be in your power, to carry into effect the said further advice, as given in the instructions* herewith furnished in a communication from the president of the National Academy of Sciences. It is, however, important that objects of natural history, ethnology, &c., &c., which may be collected by any person attached to the expedition, shall be delivered to the chief of the scientific department, to be cared for by him, under your direction, and considered the property of the Government; and every person be strictly prohibited from keeping any such object. You will direct every qualified person in the expedition to keep a private journal of the progress

* For these instructions of the National Academy of Sciences see Appendix I.

"of the expedition, and enter on it events, observations, and remarks, of any nature whatsoever. These journals shall be considered confidential, and read by no person other than the writer. Of these journals no copy shall be made. Upon the return of the expedition you will demand of each of the writers his journal, which it is hereby ordered he shall deliver to you. Each writer is to be assured that when the records of the expedition are published he shall receive a copy; the private journals to be returned to the writer, or not, at the option of the Government; but each writer, in the published records, shall receive credit for such part or parts of his journal as may be used in said records. You will use every opportunity to determine the position of all capes, headlands, islands, &c., the lines of coasts, take soundings, observe tides and currents, and make all such surveys as may advance our knowledge of the geography of the Arctic regions. **1871.**

"You will give special written directions to the sailing and ice-master of the expedition, Mr. S. O. Budington, and to the chief of the scientific department, Dr. E. Bessels, that in case of your death or disability—a contingency we sincerely trust may not arise—they shall consult as to the propriety and manner of carrying into further effect the foregoing instructions, which I here urge must, if possible, be done. The results of their consul-

1871. "tations, and the reasons therefor, must be put in writing, and kept as part of the records of the expedition. In any event, however, Mr. Budington shall, in case of your death or disability, continue as the sailing and ice-master, and control and direct the movements of the vessel; and Dr. Bessels shall, in such case, continue as chief of the scientific department, directing all sledge-journeys and scientific operations. In the possible contingency of their non-agreement as to the course to be pursued, then Mr. Budington shall assume sole charge and command, and return with the expedition to the United States with all possible dispatch.

"You will transmit to this Department, as often as opportunity offers, reports of your progress and results of your search, detailing the route of your proposed advance. At the most prominent points of your progress you will erect conspicuous skeleton stone monuments, depositing near each, in accordance with the confidential marks agreed upon, a condensed record of your progress, with a description of the route upon which you propose to advance, making *caches* of provisions, &c., if you deem fit.

"In the event of the necessity for finally abandoning your vessel, you will at once endeavor to reach localities frequented by whaling or other ships, making every exertion to send to the United States information of your

"party, preserving, as far as may be, the records of, and all possible objects and specimens collected, in the expedition. 1871.

"All persons attached to the expedition are under your command, and shall, under every circumstance and condition, be subject to the rules, regulations, and laws governing the discipline of the Navy, to be modified, but not increased, by you as the circumstances may in your judgment require.

"To keep the Government as well informed as possible of your progress, you will, after passing Cape Dudley Digges, throw overboard daily, as open water or drifting ice may permit, a bottle or small copper cylinder, closely sealed, containing a paper, stating date, position, and such other facts as you may deem interesting. For this purpose you will have prepared papers containing a request, printed in several languages, that the finder transmit it by the most direct route to the Secretary of the Navy, Washington, United States of America.

"Upon the return of the expedition to the United States, you will transmit your own and all other records to the Department. You will direct Dr. Bessels to transmit all the scientific records and collections to the Smithsonian Institution, Washington.

"The history of the expedition will be prepared by yourself, from all the journals and records of the expedi-

1871. "tion, under the supervision of the Department. All the records of the scientific results of the expedition will be prepared, supervised, and edited by Dr. Bessels, under the direction and authority of the president of the National Academy of Sciences.

"Wishing for you and your brave comrades health, happiness, and success in your daring enterprise, and commending you and them to the protecting care of the God who rules the universe,

"I am, very respectfully, yours,

"GEO. M. ROBESON,

"*Secretary of the Navy.*

"CHAS. F. HALL,

"*Commanding Expedition toward the North Pole.*"

During the brief voyage of the Polaris to New York her officers and crew entered upon their duties with energy and good conduct. The working of her engine was satisfactory. At New York Mr. George E. Tyson joined the Polaris as assistant navigator and master of sledges. The outfit of the expedition was also completed. The Polaris was still further strengthened; some changes were made in her muster-roll, and everything in the way of supplies particularly adapted to Arctic exploration was placed on board the vessel in abundance.

On the 29th of June, she left New York for New London, and finally sailed from the United States July 3d,

with the following complement of officers (including the scientific staff) and men: 1871.

Commander, Charles F. Hall;
Sailing-master, Sidney O. Budington;
Assistant navigator, George E. Tyson;
Mate, H. C. Chester;
Second mate, William Morton;
Chief engineer, Emil Schumann;
Assistant engineer, A. A. Odell;
Carpenter, N. J. Coffin (joined the ship at Disco).

Scientific staff:

Chief of corps, Emil Bessels, surgeon;
Astronomer, R. W. D. Bryan (joined the ship at Disco);
Meteorologist, Frederick Meyer.

Besides the crew of fourteen men there were two interpreters, the Esquimaux, "Joe," and his wife "Hannah."

Having now fairly launched Captain Hall on his voyage of Arctic exploration, we may pause a moment to give a more detailed statement of his views and objects. While in New York closing his preparations, Hall had enjoyed the honor of a public reception by the American Geographical Society. He had pointed out on a large Arctic map the route which he proposed to follow; referred

1871. to his long residences among the Esquimaux, which had for their object the determination of the fate of Sir John Franklin's party; and dwelt with earnestness and gratitude on the aid he had received from the Government, and upon the high expectations he had formed of the success of his "mission." But the view which it is proposed to give of Hall's fundamental conceptions, is taken in a great measure from his own private papers, elucidated in some instances by the letters of his most intimate friends. In the presence of the very distinguished audience at the meeting of the Geographical Society, to which he was introduced by their president, Judge C. P. Daly, Hall said of himself that he would rather make a sledge-journey to the North Pole than speak; adding that he had been unable to make preparation to appear before such an audience in consequence of the overwhelming occupations which had engrossed his time and thoughts.

It is indispensable, however, to a just appreciation of his energy, intellect, and devotion, that his far-reaching views on the subject of Arctic explorations should be given from his testimony before Congress, and from his own writings and the language of friends to whom these views were freely communicated. In letters of the 18th and 19th of February, addressed to Mr. Grinnell and Mr. Brevoort, he entered upon a particular examination of the best method of approaching the North Pole, and of the

time and means required, in his judgment, to carry it into execution. The objects of his proposed voyage are then presented as threefold, viz: 1st, geographical discovery; 2d, science; 3d, commerce. 1871.

Taking up the last subject first, as the most practical, it will be found that Hall points out the probability of discovering new whaling-grounds along the proposed route; and this he considers as quite sufficient of itself to justify the Government in setting on foot an expedition. In a letter to Judge Daly, dated Washington, April 9, 1871, he thus writes: * * * *

"From Esquimaux at Igloolik I also obtained important information of a new bay that will not only be of interest to geographers, but must, I think, eventually be of great value to our commerce. The entrance to this bay has only been seen, and is indicated upon the Arctic charts as Admiralty Inlet. Nothing has been known, however, by civilized men, of this bay or of its character. The entrance is from Barrow Strait, lat. 73° 43′ N., long. 83° W., and the bay extends very nearly in a southerly direction to about 71° N. lat. The west side has a coast-line on a gradual curve from Barrow Strait to near its limit, the concave on the east, while the west (east?) side has many bays or fiords, with some good harbors in them. The bay is free from ice every summer, and none of the ice from Barrow Strait ever finds its way into it.

1871. "This bay abounds in whales (*Balœna mysticetus*, or smooth-back, the most important to civilized man), in narwhals (the sea-unicorn), and in seals. So abundant are the whales that the natives sometimes kill, in their rude way, as many as five large ones in a few days.

"The information which I derived from the Esquimaux has convinced me that this new bay will prove as valuable to whalers as Cumberland Sound. From 1840 to the present time, the products of whalebone and oil from Cumberland Sound, by English and American whalers, have amounted to $15,000,000; and as the area of the whale-fishery is gradually diminishing, the fact of the existence of this bay I regard as of great value, as opening up a new ground for the prosecution of this important industry."

It was known to him, who had passed many years upon and near the old whaling-grounds, that some of them were very near experiencing the fate of those famous fishing-grounds of the tropical seas of the Pacific, which have been deserted. He believed that other and new haunts of oil-bearing animals remained to be discovered, and this belief was rationally based on observation and experience since the days of that sturdy old pioneer, Davis.

The importance of this expectation is now brought very prominently into notice by the extraordinary devel-

opment of the English jute trade with Calcutta, the successful manufacture of which artiele depends entirely on the cargoes of oil brought from the Arctic regions, and landed chiefly at Dundee, by the side of the jute manufactories, as appears in the "Statement exhibiting the moral and material progress and condition of India during the year 1872-73." 1871.

As for his first object—geographical discovery carried so far that we should be no longer ignorant of the geography, topography, and resources of any part of our northern hemisphere—he has the entire sympathy of the civilized world.

As respects science, Hall, though not himself a man of scientific education and attainments, possessed judgment and sagacity altogether too large and comprehensive not to be fully alive to the importance of its promotion; and not to know that every accession, whether of law or fact, to its domain, tended to the benefit of mankind. Upon this point all will heartily join in the opinion expressed by one of Hall's most accomplished friends and admirers, Mr. J. C. Brevoort, president of the Long Island Historical Society, that Hall was all the more fit for his undertaking because he was not wedded to any particular branch of science, but that, like Livingstone, he devoted all his energies to geographical discovery.

His views of Arctic investigation were much more

1871. comprehensive than might be inferred from the means and material employed in this his last expedition. His own plan embraced two vessels, one a steamer, the other a sailing-vessel, together with a large supply of dogs and sledges. If he could have carried out this plan, he meant to maintain an occasional communication between himself and the civilized world, wherever he might be. And there is no doubt that, for the accomplishment of this, he would have turned to a good account his familiarity with Esquimaux life, language, and customs. Thus he would have been able not only to report progress, but to receive additional aid from home. Such was his expectation. If we carry our minds back to the history of Arctic exploration, we perceive at once how many evils are avoided and how many advantages are reaped by this joint co-operation. Both the present English and the proposed German expedition are based upon this plan. This particular subject may be resumed in a future chapter.

One feature of his original plan Hall found occasion to change.

It appears in the correspondence already named that it was, at first, his settled purpose to go by the way of Jones Sound. This purpose he announced in letters to Mr. Brevoort of January 21, 1870, and in one to Mr. Grinnell, of an approximate date. He was led to the choice of this route by the opinions of his friends, the Es-

quimaux, and by Kane's experience in Smith's Sound. **1871.** But he found occasion to change this opinion before he left the United States. And we shall see further on, that, on his arrival at Holsteinborg Harbor, he received information from Baron Von Otter which confirmed him in the propriety of the change. This shows that Hall was not obstinate in his own opinions, however maturely formed. On this better knowledge he gave up the route by Jones Sound, as he had previously given up without hesitation his matured plan of proceeding, when he found that Congress would give him but one vessel and only $50,000. We learn, further, from his letters that it had been his intention, if he failed in getting the congressional appropriation, to ask that, with a small party properly equipped and provisioned, he should be landed by a naval vessel in Hartstene Bay, and left to take care of himself. He would have made that place his headquarters, and have concentrated his efforts upon explorations toward the North Pole, trusting, with the religious earnestness and faith of a sincere enthusiast, that he would finally reach the object of his devotion.

POLARIS EXPEDITION
C.F. Hall, Commanding
outward track of the Polaris
return
track of the ice-floe party
boat party
HALL LAND
WASHINGTON LAND
INGLEFIELD LAND
ELLESMERE LAND
NORTH LINCOLN
NORTH DEVON
PRINCE OF WALES LAND
BOOTHIA
GULF OF BOOTHIA
COCKBURN I.
MELVILLE PENINSULA
FOX CHANNEL
FOX ISLAND
SOUTHAMPTON ISLAND
HUDSON BAY
HUDSON STRAIT
BAFFIN BAY
DAVIS STRAIT
GREENLAND
CUMBERLAND ISLAND
Cumberland Sound
Tessiussak
Upernivik
Holsteinborg
Sukkertoppen
Lichtenfels
Frigtut
Cape Farewell
C. Chidley
Ungava Bay
LABRADOR
Newark I.
C. Harrison
Hamilton Inlet
Wolf I.
Indian Tickle
Drawn by A. Lindenkohl

CHAPTER II.

It has already been mentioned that the Polaris sailed from New London, July 3, 1871. While in that port she had been visited by a great many persons, and on the day previous to sailing (Sunday) divine service was held on the hurricane-deck by Dr. Foster, of New London, assisted by Elder Allyn, of Groton. Quite a number of ladies and gentlemen were on board from both cities. Captain Hall made a few remarks at the close of the services, introducing the officers of the ship, and setting forth the objects of the expedition. This meeting was one of special and tender interest, because several of the leading officers of the Polaris were from the vicinity. The flag presented by Mr. Grinnell to Hall at his reception by the American Geographical Society of New York, was now hoisted at the fore. This flag had been carried by the squadron of Admiral Wilkes in his expedition to the Antarctic Ocean, and subsequently by De Haven, Kane, and Hayes to the Arctic Ocean.

1871. July.

1871. July. On her voyage to Newfoundland, the Polaris encountered some heavy weather, frequent fogs, and a protracted storm, with thunder and lightning. On the 10th, after the fog lifted, she found herself embayed, and was obliged to stand southward and westward to recover her sea-room. On the evening of the same day, Cape Race was made, and at 12 m., July 12th, the Polaris anchored in the harbor of St. John's, at the entrance of which two large icebergs had grounded. On the 13th, Captain Hall and his entire staff were received by the governor of the island, his secretary, and prominent members of the legislature. They lunched at the governor's mansion, and enjoyed every courtesy and attention from the authorities of the province.

The governor and his suite were, in turn, received and entertained by Captain Hall, who conducted them over the vessel. During her stay in the harbor the ship was coaled and took on board caplins and six Newfoundland dogs, three of which were puppies.

The Polaris left St. John's at 3.30 p. m. of the 19th for Greenland, United States Consul Mulloy accompanying the vessel out of the harbor and returning with the pilot. On the same evening a remarkable instance of mirage is recorded; also an aurora borealis the rays of which formed an arch.

On the 26th, an aurora appeared in the morning,

Fiskernaes.

forming at times a semicircle, and afterward rising toward the zenith. On the 27th, the coast of Greenland was seen, and shortly afterward its high peaks, covered with snow. Toward evening the new explorers had their first sight of the natives in their kyaks. **1871. July.**

These boats, so frail and so dangerous in appearance, are perfectly safe in the hands of the natives, and are managed with extraordinary dexterity by them.

On the 27th of July, Captain Hall dropped anchor in the harbor of Fiskernaes, where he hoped to find Hans Hendrick,* the Esquimaux, who had accompanied Dr. Kane in 1853–55, and to persuade him to accompany the expedition as hunter and dog-driver. Before reaching the settlement, the governor, Mr. Schoenheidter, came on board the Polaris. Captain Hall returned his visit. Dr. Bessels also went on shore to gather botanical and geological specimens. Such of the crew as could be spared obtained permission to go ashore, where they enjoyed themselves in dancing with the young girls of the settlement. The next day the ship was visited by the greater part of the population, especially by the women. They attracted much attention by the peculiarity of their dress, wearing boots of well-tanned seal-skin reaching above the knee, seal-skin trousers tastefully ornamented with needle-work, and jackets covered with bright cloth, and neatly

* Called Hans Christian by Kane, and by Hall quoting Kane.

1871. trimmed around the neck, wrists, and lower edges with
July. fur and pretty bead ornaments. Some of these women were thought to be handsome; the majority, however, when first seen by the white man, have a decidedly repulsive appearance.

In the afternoon, Dr. Bessels and Engineer Schumann, accompanied by Nindemann and Mauch, visited the settlement Lichtenfels under the Moravian missionaries Stark and Kroft. This journey was made in an open whale-boat during a violent rain-storm. The party was greeted with great cordiality by the missionaries and their ladies. They learned from Mr. Stark the particulars of the loss of the German exploring vessel, the Hansa. He was stationed at Freiderickstadt when the shipwrecked crew landed in their boats.

The Esquimaux under the care of these missionaries are distributed over five different settlements, and number in all 261 souls, of whom more than half live in Lichtenfels. After supper the party took leave of these excellent people with the kindest remembrances. On the same evening preparations were made for sailing. The Polaris left Fiskernaes next morning at 4 o'clock, encountering rough weather outside.

At 10 a. m. of the 31st of July, she anchored in Holsteinborg, a Danish settlement containing about sixteen huts and fifty people.

Lichtenfels.

Hall was agreeably surprised to find here the Swedish Scientific Expedition, composed of a brig and a small steamer, under the command of Baron Von Otter, which had been to Disco and Upernavik, and was now on its way home. The Baron had been successful in reaching latitude 75°, in having obtained several very large masses of meteoric iron, and in having made a number of deep-sea soundings and observations for temperature; all of which could not fail to contribute largely to a better knowledge of the hydrography of those waters. 1871. July.

Hall was told at Holsteinborg that Hans, the dog-driver of Kane's and of Hayes' expeditions, was at Upernavik, and that he would await in that place his arrival—a piece of information confirmed by the Swedish expedition. The expedition brought further good news from Upernavik, informing Hall that the season for Arctic navigation was a remarkably favorable one; that only occasional bergs had been seen between Holsteinborg and Disco; and that for several weeks none had been seen between Disco and Upernavik.

On the day of the arrival of the Polaris, Nindemann, one of her seamen, came very near losing his life in an attempt to manage one of the native kyaks. He lost his equilibrium, and would have been drowned but for the timely assistance of a boat from the Swedish frigate. The Polaris had no boat alongside in the water.

1871. July. After performing this humane service, the frigate, with her consort, resumed her voyage, and as they expected to stop at St. John's, Newfoundland, Captain Hall improved the opportunity of forwarding by them dispatches to the Secretary of the Navy.

In Governor Elberg Captain Hall found an old friend. In 1860, while on his first expedition in search of Sir John Franklin, he had spent seventeen days in Holsteinborg, to a description of which visit he devotes the second chapter of his work entitled "Arctic Researches."

By direction of the Secretary of the Navy, if the transport which was to carry stores and provisions for the Polaris to one of the Greenland ports did not overtake the ship before reaching Holsteinborg, Hall was to wait there as long as he thought proper, and then proceed to Godhavn. In the neighborhood of Holsteinborg, in former years, many deer were killed; he anticipated, therefore, no difficulty in obtaining a sufficient number of deer-skins to furnish the whole company with warm winter clothing. Much to his regret, he learned that no deer had been seen for a number of years. The governor endeavored to supply this deficiency, but was able to provide only a few seal-skins and some dog-skin clothing.

While in the harbor, Dr. Bessels commenced his series of photographic views; his operations were watched with interest by the natives. Two of the crew of the Polaris,

Holsteinborg.

Mauch and Hayes, attempted the ascent of a peak the summit of which was covered with snow. After a severe struggle they were obliged to abandon the enterprise on account of the rugged character of the cliffs. They did not reach the ship until midnight. **1871. August.**

In expectation of the arrival of the United States ship Congress which was to renew his supplies and furnish him with the latest instructions, Hall remained in Holsteinborg until 2 p. m. of August the 3d. On leaving the harbor, several American schooners were seen at anchor about eighteen miles from land, engaged in fishing upon a well-known bank on which halibut and cod abound.

Steaming up the coast and keeping about twelve miles from the land, the Polaris passed numerous icebergs, which for size, beauty, and, in some cases, grotesqueness of form, were quite remarkable. Twenty-four hours after leaving Holsteinborg a native pilot was taken on board, and the vessel was conducted safely through the narrow, winding channel into the harbor of Godhavn. The anchor being let go while the vessel was still under considerable headway, the cable parted. After mooring, the lost anchor was recovered.

Chief-Inspector Krarup Smith, the superior officer in North Greenland, proved to be on his annual tour to the principal settlements of the district, but Hall was received most cordially by the inspector's lieutenant, Governor Los-

1871. August. sen, who spoke Danish only. A competent interpreter and an ardent advocate and friend was found in Mrs. Smith, the wife of the chief inspector.

On Saturday, the 5th, the "crow's nest" was secured in its place.

On the 6th, Captain Hall went to church, accompanied by several of his people. He was struck with the neatness of the chapel, and equally so with the decorum of the congregation. The seats were common benches. About thirty persons were present, of whom the majority were women, while boys comprised the greater part of the male portion of the congregation. In the absence of the regular clergyman the catechist conducts the worship. His regular duties are those of town clerk or recorder, and of village schoolmaster. The services were very simple. Three hymns were sung, or rather chanted, in a low tone of voice, the slowness of utterance increasing the monotony. A passage of Scripture was read, prayers were offered, and a sermon preached.

The same day Mr. Chester was dispatched for Chief-Inspector Smith, whom he found at Rittenbeck. This involved a boat-journey of one hundred and seventy-five miles. Captain Hall praises Mr. Chester for the alacrity and intelligence with which he executed this duty. Mr. Smith at once responded to the request of Captain Hall. Relinquishing pressing duties, he arrived at Godhavn at 6

Godhavn

a. m. of the 11th. Before his return, the United States ship Congress, under the command of Capt. H. K. Davenport, U. S. N., anchored in the harbor, and brought with her not only the needful stores and supplies, but relief from the load of anxiety which was weighing on Hall's mind. **1871. August.**

August 7th, the ship was thoroughly cleaned, and in the course of the next two days was painted. Hall entertained at dinner Mrs. Inspector Krarup Smith and Governor Lossen and his wife.

At 11 a. m. of the 11th, Captain Davenport, accompanied by Captain Hall, went in full uniform to pay an official visit to Mr. Smith. As he landed he was received by a salute from a battery of six 6-pounders, and was escorted by Governor Lossen to the house of the Inspector, where he was received "with every mark of official and personal respect and consideration." The salute was returned by the Congress with an equal number of guns, the Danish flag being hoisted at the foremast-head.

Captain Davenport presented to Mr. Smith letters from the Secretary of the Navy, and received the assurance that the Danish authorities would take great pleasure in extending to Hall all the assistance in their power; Inspector Smith at once making known his own cordial desire to extend to the North Polar Expedition all the aid and co-operation asked for in the letters of the Secre-

1871. August. tary. He consented to receive in the government storehouse the stores and provisions intended for the use of the Expedition, promising that they should be carefully preserved, at the same time declining any remuneration for this and all other kindnesses. At this place Hall also endeavored to obtain the services of Hans and those of a Dane by the name of Jensen, at that time governor of Tessi-Ussak, formerly of Dr. Hayes's expedition, both of whom belonged to the government service, in which they were very useful. Inspector Smith showed his usual generosity in the offer of his influence to secure them for Hall.

On the 13th, Mr. Smith visited the Polaris and the Congress, and was received with a salute of fifteen guns from the latter vessel. Divine service was conducted on board the Congress by the Rev. Dr. Newman, at which were present the crews of both vessels and most of the inhabitants of Godhavn.

During the next few days, coal and supplies of various kinds were transferred from the Congress to the Polaris until she was filled above and below decks to her utmost capacity. The remainder were stored in the public building furnished by the Danish inspector.

At 2 p. m., of the 17th, the anchor was weighed and the Polaris stood out of the harbor. In passing, the Congress manned her yards and rigging and gave the

Polaris hearty cheers, which were returned with equal spirit and good will. Before weighing anchor, the crew of the Polaris had been mustered on deck to receive from Captain Davenport some judicious instruction and counsel concerning their future conduct. He pointed out to them that implicit obedience and perfect harmony were the necessary conditions of success. This advice, considering the heterogeneous character of the ship's company, was well-timed. Rev. Dr. Newman of Washington, a passenger in the Congress, also addressed them and commended them and their expedition to the favor of Heaven. **1871. August.**

The separation of the Polaris from the Congress was attended by the expression of some private griefs caused by the parting of relatives. Rev. E. D. Bryan, of Carbondale, Pennsylvania, who had also come out as passenger in the Congress, was parting with his eldest son, R. W. D. Bryan, the astronomer of the expedition, and Captain James Budington, of Groton, Connecticut, ice-pilot of the Congress, and previously well known as the discoverer of the British ship Resolute in 1855, was taking leave of his nephew, Captain Budington of the Polaris.

Hall's dispatch of this day, the day of his sailing from Godhavn, contained an earnest expression of his gratitude for the perfect manner in which the expedition had been, in all respects, equipped, and in a subsequent

1871.. August. letter of the 22d instant he makes use of this expression: "Never was an Arctic expedition more completely fitted out."

Following the shore-line at an average distance of ten miles, he passed an innumerable succession of ice-bergs. Several hump-back whales appeared close to the vessel. Shortly after meridian of the next day, Swarte Hook was on the starboard beam, distant about eight miles. At 10 p. m., while passing the island of Kasor-soak, the sea was seen breaking on two dangerous reefs about four miles from the vessel. Steaming slowly among the many small islands, a careful lookout was kept for reefs and sunken rocks.

At 1 a. m. of the 19th, having neared the settlement of Upernavik, a native pilot was taken on board, and in half an hour the vessel was safely anchored in the harbor. Hall had accomplished the voyage between Godhavn and Upernavik, a distance of 225 miles, in 33½ hours. Owing to the distance from the village and the unseasonableness of the hour of the ship's arrival, it was some time before the inhabitants could be awakened. It was not, however, very dark; at midnight the sun was only four degrees below the horizon; and, as now it was but an hour and a half to sunrise, the eastern sky was bright with the coming day.

He was received in the most cordial manner by Gov-

ernor Rudolph, who readily complied with all his requests. One kyak was dispatched with letters to Hans Hendrick, at Proven, about fifty miles distant to the southward where he actually proved to be; and another to Jansen, of Tessi-Ussak, the same distance to the northward, requesting them both to prepare to leave home at the shortest notice. **1871. August.**

Mr. Chester also left in a boat for Proven, to bring Hans and his family. He reached that place before midnight, and leaving at 8 o'clock on the morning of the 20th, returned with them to Upernavik on the evening of the same day. His boat presented a singular appearance, being loaded from stem to stern with bags, boxes, and skins, on the top of which were children, dressed in ragged and filthy skin clothing. When the family came on board the Polaris with their luggage, consisting of tents, cooking-utensils, tools, implements of the chase, and three or four puppies whose eyes could scarcely bear the light, an opportunity was given of witnessing the domestic habits of this people.

In the exceedingly crowded condition of the vessel, it was difficult to find a place to stow this family, with their goods and chattels.

With the full consent and co-operation of the Danish authorities in Greenland, Hall secured the services of Hans as dog-driver and servant, with the agreement that his wife and three children were to keep him company.

1871. August. By this contract Hans received a salary of about $300 per annum, or, more exactly, fifty Danish dollars per month.

William Morton, the second mate of the Polaris, who had been associated with Hans under Kane; in making his memorable sledge journey to Cape Constitution, came forward and spoke to him; but the latter did not recognize him. On Morton's pointing, however, to some scars on Hans's right hand, the remains of injuries sustained by a powder explosion on the shore of Kennedy Channel, Hans at once recalled the circumstance, and recognized Morton as the only spectator of that catastrophe, apologizing in his rude way, for not knowing him, by pointing to the change in his hair and beard, due to the lapse of nearly twenty years since they were together.

In the harbor of Upernavik the Polaris met the Danish brig Julianhope, which comes annually from Denmark to bring supplies to the Greenland settlements, and to receive the skins, oil, and dried fish which have been obtained by trade with the Esquimaux.

There are two anchorages off Upernavik one of which is directly in front of the settlement; the other, in its rear about a quarter of a mile over the rocky ridge; the latter is really the harbor, the former affording no protection from either the southerly or the westerly winds. Both the Polaris and the Julianhope were in this small, land-locked harbor. The vessel was visited by Dr. Ru-

dolph and Governor Elberg, who, upon receiving the letter from Mr. Krarup Smith, delivered by Hall, expressed a readiness to render the expedition all possible aid. **1871. August.**

The Upernavik settlement consists of some twenty-two houses inhabited by sixty Esquimaux. They appeared even less cleanly than those in the more southern settlements. Just back of the settlement, on the slope of the ridge, is the graveyard, distinguished by crosses, head-boards, and little inclosures marking the graves. The absence of vegetation, the want of method in the arrangement of the graves, and the dismal aspect of the fragments of unsightly rock covering the surface, added greatly to the sadness and dreariness of that northern cemetery. The hardness of the ground making it necessary to place the coffins on its surface and cover them with stones, the remains, in the course of time, often become exposed.

Dr. E. N. Rudolph, quite an old man, had passed the greater part of his life in Greenland; but now intended to return to Denmark in the Julianhope, to spend the remainder of his days. It may be mentioned here that he actually did return in the autumn; but, failing to find in civilized life the contentment he looked for, he came back to Greenland the next year.

Early in the morning of the 21st, the Danish brig Julianhope, loaded with the blubber and skins accumu-

1871. August. lated at Upernavik during the preceding year, was got ready to sail to the mother country. Governor Rudolph, the evening before, gave a farewell banquet to his associates, to which he invited the officers of both vessels. The Polaris made an unsuccessful attempt to tow the Julianhope to sea. During the day five tons of coal were taken on board, besides ninety seal-skins and one hundred dog-skins. Twelve dogs were added to the pack, increasing the certainty of the night's being made hideous by interminable howlings.

Mr. R. W. D. Bryan, having been now appointed chaplain by Captain Hall, was required to conduct divine service on Sundays in place of Captain Hall, who had, himself, thus far officiated.

The Seamen's Friend Society of New York City, in addition to the gift of a ship's library which they usually make to all vessels bound on long cruises, had presented to Captain Hall copies of "The Sailor's Companion," for use on the Polaris. This work, prepared by Dr. Jas. Alexander of Princeton, contains a manual of worship, forms for special occasions, and sermons from the pens of eminent divines. The society also presented copies of sermons by Rev. Dr. W. S. Plumer, D. D., of South Carolina. The American Tract Society gave a number of hymn-books, called "Songs of Zion." The Bible Society had made a donation of a number of bibles.

1871. August.

The members of the scientific corps were by no means idle during the short stay in Upernavik. Many observations for position were made, and the magnetic elements of the place were determined. Collections were made illustrating the fauna and flora of the adjacent region, and its geology received careful study. The photographic apparatus was called into requisition, and many portraitures of Esquimaux life and characteristics were prepared.

As a part of the preparations for sea, the sufferings of the pig bought in St. John's were brought to an end, and his body was hung in the rigging in company with the remains of a quarter of beef.

Governor Elberg kindly consented to accompany the expedition as far as Tessi-Ussak, in order to receive from Jensen his office and its trusts, should he conclude to join the expedition, as he had intimated he would in a letter brought back by the messenger sent with Hall's proposal.

When Captain Hall had made up his dispatches for the Secretary of the Navy and placed them in the hands of Governor Rudolph, the anchor was weighed at 10.30 p. m., and the Polaris left Upernavik. Steaming twelve miles to the northward and westward, a little before midnight the small island settlement of King-itoke was reached. Captain Hall and Governor Elberg landed with a boat's crew to negotiate for dogs and furs; and

1871. August. while they were absent, the vessel lay to, only using her engine occasionally to avoid the ice drifting about in small fields and detached pieces. The governor of the little settlement had a large number of very fine dogs, but no offer made by Captain Hall could induce him to part with any of them. With considerable difficulty, and mainly through the efforts of Governor Elberg, eleven dogs were obtained from some of the inhabitants; a few seal-skins and dog-skins were also purchased. At 1 a. m. of the 22d, they returned to the vessel and started at once toward Tessi-Ussak. Good native pilots pointed out the many reefs, the sunken rocks, and the clear channels among the numerous islands that line the coast in that neighborhood. Many icebergs were met; and a considerable quantity of broken ice, confined by the configuration of the continental and insular coast-lines, added greatly to the dangers of navigation.

At 6 a. m. the anchor was dropped near the settlement of Tessi-Ussak. Here Hall was doomed to another disappointment. He found that Jensen was unwilling to leave home, pleading as his excuse the circumstances of his family, and especially those of his wife. He offered at the same time to assist in furnishing dogs, furs, &c.. to the expedition.

Here, as in Upernavik, every effort was made to obtain natural specimens of all kinds; and the opportu-

nities of studying the geological formation and evidences of present and former ice-action, were diligently improved. **1871. August.**

On the 23d, a heavy fog-bank outside added new dangers to a navigation very hazardous in the best weather and under the most favorable circumstances. In the little harbor it was a delightful day. The crew enjoyed their brief period of leisure in rambles over the rocky shore, making the most of the calm air, the genial warmth, and the gladsome sunshine. The tanks were filled with fresh water, and there were no deficiencies in the supplies of vessel and crew which were not made good while waiting for the lifting of the fog.

Hall was now entirely ready to take leave of the civilized world, and to enter upon his field of Arctic exploration. He was as well prepared in mind as in means to encounter the difficulties and dangers belonging to his future labors. He was entirely satisfied with his vessel, with her equipment and outfit, and with the promise immediately before him.

"The prospects of the expedition," he writes, "are fine; the weather clear and exceptionally warm; every preparation has been made to bid farewell to civilization for several years, if need be, to accomplish my purpose." His coal-bunkers were full; he had wood and resin in considerable quantities that could be used for steaming in any emergency.

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He declares that there was nothing to regret, but, on the contrary, there was reason to rejoice that everything pertaining to the expedition was in a more prosperous and successful condition than he ever had hoped or prayed for. And this declaration is accompanied by an expression of trustful, religious dependence, which increased his sense of gratitude and his hopes of success.

The fog still continued on the 24th as thick as ever; but Captain Hall decided that it would delay the expedition too much to wait longer for its dispersion. Accordingly, at 1.30 p. m. the anchor was weighed and the vessel steamed out of the harbor, having on board Governors Elberg and Jensen. It was chiefly by the skill of Jensen that she was steered through the intricate navigation. At 3 p. m. the governors took leave in their boat, carrying with them the native pilot and Hall's last dispatches.

III.

CHAPTER III.

On leaving Tessi-Ussak Captain Hall gave directions to the sailing-master to stand due north twenty-five miles, and, after passing between two large islands, to keep the ship on her course. 1871. August.

The complement of the Polaris had been filled at the last recruiting station. Her full number was now thirty-three, of which eight were officers and three, members of the scientific corps. The steward, the cook, two firemen, ten seamen, and eight Esquimaux filled up the roll.

Notwithstanding the positiveness of Jensen that at the termination of the twenty-five miles upon a due north course the two islands would certainly be seen, they were invisible, although the pilot's instructions had been carefully observed. The fog still hung closely about the vessel, and apprehensions were felt that trouble might ensue from the islands not being seen. Double lookouts were stationed, and, under the most careful watch, five

1871. **August.** miles were added to the twenty-five; after which, the islands not having been seen, the coast dangers were considered as passed, and the vessel's head was hauled up northeast. To make this clearer to the unprofessional reader, he is reminded that the directions here named are compass courses, and that in this vicinity the westerly variation of the compass is about seven points and a half.

The fog continued through the night, and many icebergs were met; but, as the sea was smooth and the wind light, the vessel was under good control and no trouble was experienced in keeping clear of them. In the small hours of the morning it was so damp and chilly that the decks were deserted except by the officer of the deck and the watch. Although the thermometer did not register lower than 35° 5′, the ship's rigging was covered with icicles, which increased, until, loosened by their own weight or by the jar of the rigging, they fell to the deck.

About noon of the 25th the fog lifted, and the breeze freshening, all sail was set. At 6 p. m. land was sighted, which, from its bearing and apparent distance, was pronounced to be near Cape York. An hour after, pack-ice was for the first time encountered. The sails were furled, and for three hours and a half the vessel steamed slowly through. The pack was, however, comparatively loose

Working through Ice.

and open, though composed of large pieces, and the vessel made her way with little difficulty. **1871. August.**

Coming again into open water, the sails were set and a direct course was run for the Cape. The weather continued clear and pleasant, but the sea was quite rough. As the light became more imperfect and objects more indistinct, additional care was exercised to avoid the numerous icebergs. This proved to be an act of prudence, since the vessel narrowly escaped running with fair speed into one of the large bergs.

At 5 a. m. of the 26th, close pack-ice was again encountered, extending westward. Unable to force a passage through, the vessel ran to the westward, along the southern edge of the pack, for three hours, when the ice was found more loose, and after a little buffeting and struggling with the irregular and ofttimes weighty masses that composed the pack, she once more resumed her course in open water.

The vessel continued for the next hour and a half on a course about N. N. W. true, at the rate of five and one-half knots an hour; at the expiration of that time she was north of Cape York, which bore E. S. E. $\frac{1}{2}$ E. true.

At ten minutes past two, Cape Dudley Digges was directly east, distant about eighteen miles. Awash Island was passed at 5 p. m. At 7 p. m., while between Wolsten-

1871. August. holme and Saunders Islands, a large number of walruses were seen lying on the ice. Two floe-pieces two or three feet thick, and each covering an area of about half a mile, were black with the large ungainly creatures. They were enjoying their sleep, having, as is their habit, some of their number on the watch to give the alarm in case of approaching danger. The vessel moved with but little noise, and the lookouts of the party evidently did not consider her very dangerous, for their only sign of apprehension was a more frequent raising and rolling about of their heads. The rest of the company remained undisturbed, except that one here and there turned lazily over, or otherwise changed his position. All was excitement on board the Polaris. Many had never before seen the animals, and were curious to observe their appearance and actions. Even those who had often captured them hurried to the side to get a nearer view of the sleepers. They were so closely huddled together that it was difficult to distinguish them individually. Esquimaux Joe, animated by his love of sport, with his rifle ready stood in the bow. It was proposed to man a boat and attempt the capture of at least one of the walruses, but Captain Hall decided that this would delay the vessel too much. He ordered a boat's crew, however, to be in readiness in case Joe succeeded in killing one. The ship's course lay directly between the two floes, and as she approached within easy range of the

Shooting Walrus, Aug. 26, 1871.

smaller, the animals became restless, and those near the edge of the ice began to roll off into the water. Joe fired at the largest of those nearest. One animal, by its actions, plainly showed it had been hit, but it followed the example of its companions, who had been only aroused by the report of the rifle, and, working its way with them to the edge of the ice, tumbled into the water. In an instant all had disappeared. Nothing except a little blood upon the ice, remained as proof of Joe's dexterity. **1871. August.**

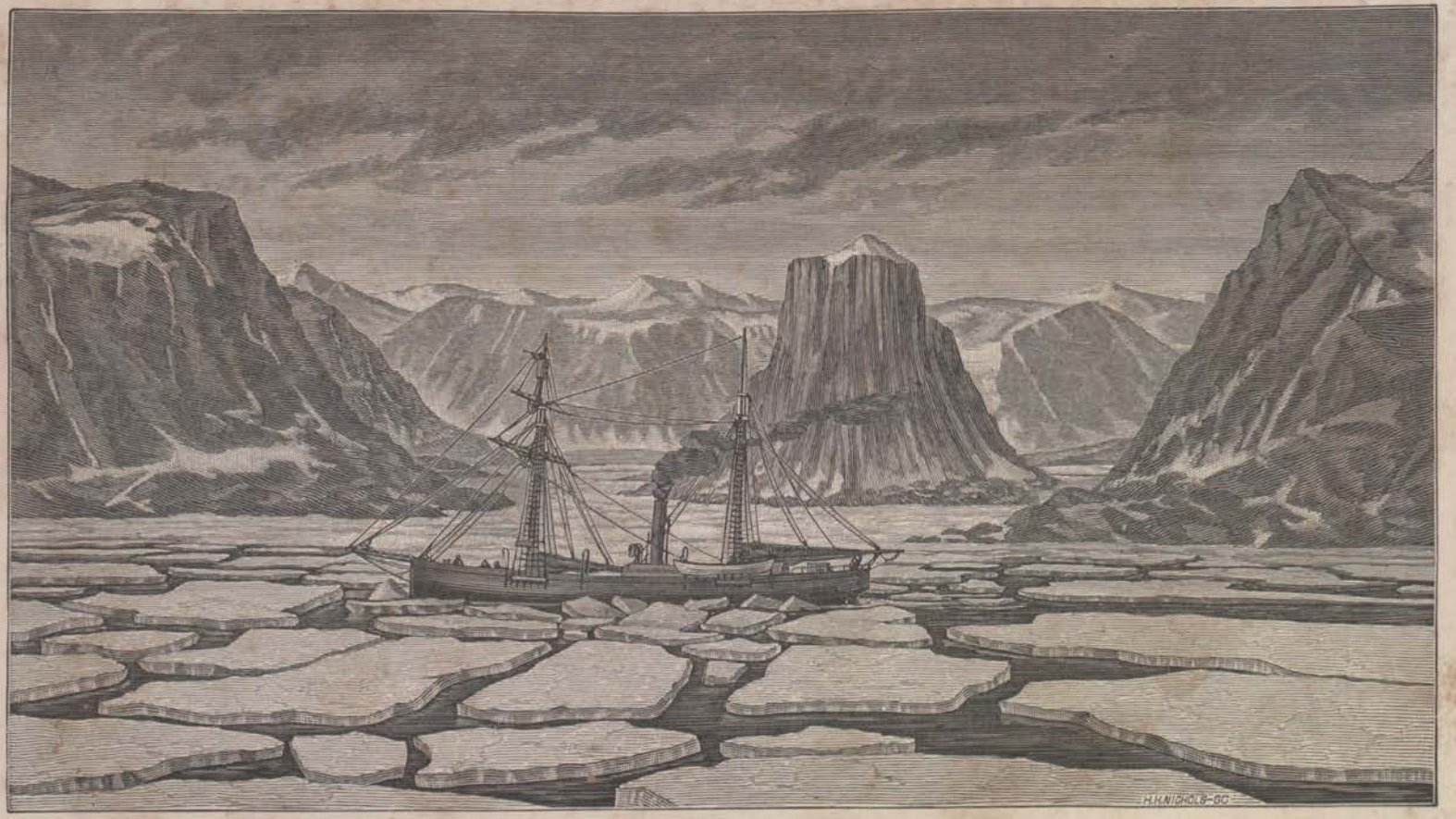
The vessel stood for the floe on the starboard bow, and although the walruses on it had been disturbed by the attack upon their neighbors, they allowed her to come within rifle-shot before they began to move. Joe fired again with the same success. A small streak of blood left upon the water, as the wounded animal disappeared, was again the only witness that the shot had taken effect.

The walrus has always been considered an animal hard to kill instantly, even with the rifle. Its skull is thick; and some have contended that it cannot be penetrated with a rifle-ball, and that the only way of reaching the brain is through some of the natural openings. Its body is so large, and encased in such a thick layer of blubber under a very tough skin, that to shoot it through the heart is seldom attempted.

A great deal of ice was found off the northern entrance to Wolstenholme Sound. The passage through it

1871. August. was effected with much difficulty. This was what is known as "bay-ice" of one winter's growth, not compact, but broken up into fragments of every shape and form. The ship easily turned aside the smaller pieces or sank them, and split the larger blocks by running against them with full speed. Where the ice was loose, this was attended with little or no delay, but where it was closely packed, the Polaris had a difficult task to perform, even when the thickness did not exceed a foot. At 10.30 p. m., Fitz Clarence Rock was passed, and at midnight the vessel was opposite Cape Parry.

Still steaming through leads in the ice, at 5.20 a. m. of the 27th, off the western shore of Hakluyt Island, she was compelled, *for the first time*, to stop, on account of the compactness of the mass. At this point the ice changed its character. Hall began now to encounter the solid and permanent packs, accumulated in bays and straits, and heavily massed around outlying islands. Although occasionally forced to stop, to back, and try in other places where the ice was more yielding, the vessel continued to advance. The lookout in the crow's-nest reported unfavorably upon the ice ahead; but still progress was made. The vessel, trembling under the rapid and continuous revolutions of her engine, butted against the icy wall with success, and compelled it to yield. With skillful management and a judgment matured by



Passing Fitz Clarence Rock, Aug. 26, 1871.

long experience, the sailing-master selected the weakest points for attack, and took advantage of the most favorable openings. The Polaris forced her way through, overcoming all obstacles, and at 9.50 a. m. of the 28th, was again in open water, 1871. August.

A breeze from the north was now felt, which partly accounted for the compactness of the ice through which she had recently struggled.

Meeting with no other ice except a few bergs, the ship made rapid progress. At 3 p. m., she was opposite Cape Alexander; at 5, Littleton Island was passed; at 6.30, she was abreast of Cairn Point; and at 8, the parallel of Rensselaer Harbor was crossed. This was a source of great gratification to Captain Hall. The whole crew sympathized with him in his good fortune, and were eager to press on. Smith's Sound, which had been supposed to be continually covered by a heavy, impassable ice-pack, was found open. The ship had already reached a latitude higher than that attained on this route by the vessels of any former expedition.

Although very little ice was found lying in the direct course for Cape Frazer, long lines of bergs were seen to the eastward. Patch-ice was occasionally met. The short detour generally made to avoid it was rendered easy by the existence of open water to the westward. The vessel was forced through brash or posh ice or a

1871. August. loose stream, without material change in her course. No unnecessary trials of her strength were made. Where there was room for working, all bergs, large pieces of ice, and compact masses were carefully avoided, even when in order to do this it was necessary to make considerable deviation from the given course.

About midnight of the 27th, a very heavy pack, having no opening to the east and extending north as far as could be seen from the crow's-nest, made it necessary to run several miles westward. In about two hours the Polaris rounded the southwestern point of the pack, and following closely its western edge was able to resume her course.

At 3.30 a. m. of the 28th, Cape Hawks was on the port beam, about fifteen miles distant. Here heavy ice was again met. The pack to the eastward consisted of floes very thick and extensive. Many pieces had been made by the aggregation of thin ice piled up by repeated pressure. These are called hummocks and hummocky ice, although the same terms are applied to similar masses formed upon the surface of a floe near its edge, as well as to those which rise in the center of recently-formed bay-ice. Occasionally a large berg added its bulk and weight, materially increasing the momentum of the pack. Many of these bergs were the remains of gigantic ice-fields, or the result of a strife between heavy floes in which one

was overrun by the other, forming, after two or three encounters, a compact mass from 50 to 100 feet in thickness. Others again were fragments, or small specimens of icebergs, making their way gradually from the north to the banks of Newfoundland, where they disappear. **1871. August.**

To the west and north the land seemed ice-bound, and many hummocks and fragments of floes skirted the edge of the land-ice.

As the vessel headed for Point Joy, the prospect of a passage between the land-ice and the pack appeared by no means favorable. But when within a few miles of the Point, the lookout in the crow's-nest discovered that the land-ice between Point Joy and Cape Frazer was detached, and that there was open water along the shore, dotted with floes and masses of every size and shape, brought down by the current eddying around Cape Frazer.

During the first morning watch, the sun, hitherto hidden by the mountains of Grinnell Land, suddenly shone out, causing a universal exclamation of wonder and delight. The line of reflected light was singularly brilliant where it crossed the patches of water, and it was rendered iridescent where it fell on the edges of the hummocks, on the fractured ice, or on the pack itself. The irregular surface of the pack comprising the general level of the young ice, the undulations of the old floes, and the

1871. August. sharp prominences of the bergs, together with the unending diversity of form in the hummocks, kindled the imagination which discovered every variety of form and of object, animate and inanimate.

The contrast between the snows of the hills and the dark hue of the waters in shadow, was also a striking feature of the view. An attempt to convey any distinct idea of the scene is perhaps useless; it was impossible to witness a blaze of splendor so great and varied without being affected by its material beauty and its moral impressions. The sky was cloudless and the atmosphere pleasant. It is not surprising that the little company of explorers derived encouragement from these bright and cheering influences.

When within five miles of Point Joy, the vessel rounded the northwestern prolongation of the pack and ran into comparatively open water. A small bay was seen which, from its situation, was thought to be suitable for a harbor. The ship had now reached a higher latitude than Captain Hall had expected to attain, and, although anxious to push as far north as possible, he was still disposed to leave her in winter quarters at this point, confident that he would be able, under favorable conditions of the ice, to reach the Pole in sledges.

Before attempting, therefore, the navigation of Kennedy Channel, he resolved to explore this bay, in order

that he might, if it should prove sufficiently large and safe, occupy it as his winter quarters, provided the condition of the ice in the channel should prevent further progress. A boat was accordingly lowered and manned, and Captain Hall, accompanied by the first mate, sounded the entrance to the bay. He ascertained its depth, landed, and made a short but thorough examination of its surroundings. The water proved to be not quite deep enough for the vessel, although in other respects the bay was suited to make a comfortable winter's home. **1871. August.**

After an hour's delay, at 7.50, the Polaris resumed her course. Steaming another hour through very loose ice she passed Cape Frazer, while as far as could be seen from the mast-head, there was no ice to the north. Running along the land, at a distance of five miles, she made so much progress that at 12.30, Cape Norton Shaw was passed; at 2.30, Cape McClintock; and at 3.45, Cape Lawrence. The positions of these prominent capes appeared to correspond with the chart, but it was impossible to make out the exact form of the coast-lines.

The eastern coast of the channel was in plain sight. The width of its southern entrance is about thirty-five miles, and it decreases further north to twenty-five miles.

The day did not continue as pleasant as the early morning promised; clouds obscured the sun, and there was every indication of a long spell of cold and wet

1871. August. weather. At 7 p. m., a copper cylinder, containing a record of the progress of the expedition, and securely sealed, was thrown overboard. At 11 p. m., a dense fog filled the straits; no land could be seen on either side of the channel. There being no ice to contend with, a bright lookout was kept for shoals or breakers while the vessel pursued her course.

A little after midnight, a small island was discovered, and as the Polaris passed near its western side it could be plainly seen, notwithstanding the fog. The south side appeared to be perpendicular and fifty or sixty feet high; from this it sloped gradually to the north. Owing to the fog no estimate could be formed of the extent of this island. It does not exist on the chart of Dr. Hayes. A little bird flying over it was the first living creature that had been seen since entering the channel.

At 2.15 a. m. of the 29th, a delay of 30 minutes was occasioned by the necessity of making some repairs to the engine. At 3 a. m., the fog lifted, and the ship was found to be surrounded with numerous patches of ice, and several small icebergs. The land on both sides of the channel was in sight. It was very high, the west side being the higher. It was nearly free from snow.

At 9 a. m., the fog settled about the vessel, and as the ice began to be heavier and more compact, it was deemed safer to fasten to a large floe, and wait until it should

clear up. This afforded a good opportunity to take a sounding; the apparatus was prepared, and 200 fathoms of line were run out without touching bottom. In attempting to haul in the line it parted, and nearly all of it was lost. **1871. August.**

Ten minutes before noon the fog cleared. This furnished the opportunity for taking the meridian altitude. Every sextant and quadrant was called into requisition.

The horizon was not, perhaps, so good as a water horizon; yet the ice was, in some places, so low and free from hummocks, that it afforded a very fair means of approximating to the sea level. Four of the instruments agreed in giving for the latitude 81° 20′; which was adopted. The vessel had been drifting with the ice since 9 a. m. The longitude was determined by morning sights taken at 8 a. m., using this latitude; it being assumed that the drift from 9 a. m. had brought the ship back to the position she occupied when the morning observations were taken. The result placed the Polaris in longitude 64° 34′ west of Greenwich.

When the fog lifted so that the ice ahead could be seen, the engine was set in motion, and the ship was worked northward between very large floes. Cape Lieber was distinguished on the western coast. The eastern coast appeared at first to bend to the east, and then to the west, and, uniting with the western coast, to form a

1871. August. large bay, the extreme width of which might be thirty-five or forty miles, with Kennedy Channel for its southern outlet.

At 1 p. m., however, a strait some twenty miles in width was distinguished, and the ship's head was turned toward it. The southerly current was very strong, and carried with it large quantities of ice.

At 4.30 p. m., it again became foggy; after making an attempt for an hour and a half to advance, the ship was again fastened to a floe. Here another cylinder, properly prepared, was thrown overboard.

At a quarter past seven, the fog again lifted and the vessel once more resumed her course. The ice through which she was working her way was more formidable than any that she had hitherto encountered. Old floes of great area and thickness piled themselves one upon another.

The noise produced by these contacts is peculiar. It varies in intensity and in the character of the sound. The floes were often three or four miles in extent; before risking the ship between two such masses, it was necessary to be sure either that she could pass through or could reach an indentation where she might be secured during the conflict. These emergencies required prompt decision.

Matured experience and judgment are indispensable in this peculiar navigation. Captain Hall had good reason

for self-congratulation upon his selection of officers; and the people, by their activity and promptness, performed their part faithfully. **1871. August.**

The strait through which the vessel continued slowly to work its way trended northeast; it is from twenty to twenty-five miles in width, and is bordered by high mountainous land, broken here and there by ravines, but in general presenting a perpendicular line of cliffs, with terraced *débris* at the base, sloping to the water's edge. There was no snow on the land, and, excepting the ice, there was no evidence that the region was fifteen and a half degrees above the Arctic circle.

The full force of the current was now felt, and the ship labored hard to make much progress. To increase the difficulties of navigation, the fog again settled down, and shut out everything from view. Captain Hall was much disappointed at this. It cast a damper over the pleasant expectations which had been indulged by all on board in consequence of their early success.

When the vessel started, everything seemed favorable: the fog lifted; the weather became cooler; and a breeze sprung up from the north. The old and experienced Arctic navigators predicted clear weather, but in a short time they were compelled to acknowledge their mistake. Every effort, however, was made to overcome the difficulties, and the word was always "Onward."

1871. August. During the remainder of the night, and for several hours of the early part of the 30th, the ship was kept moving toward the north; immense ice-fields were passed, increasing, with the latitude, in size and number.

At 6 a. m., the highest point was reached. The ice then became so compact that it was impossible to force the vessel through. So far as the eye could penetrate the fog, there was no open space to the north; even if there had been, there was no passage leading to it. The Polaris had reached the northern limit of her voyage. Herman Siemens (whose record of the state of the ice at that time is the only one preserved), says, "We saw firm ice from one coast to the other."

Feeling a pride in what the ship had already done, Captain Hall was ambitious to accomplish still more, and was grieved when he found himself in front of an impassable barrier. He enjoyed, however, the satisfactory reflection that everything had been done that was possible. He did full justice to the exertions of his officers and men. Up to this time (as on subsequent occasions) the vessel proved well fitted for the service.

It is impossible to determine the precise latitude which the Polaris had attained when at her highest northing. Eighteen hours before, her position had been accurately determined; from that point her place was

carried forward by dead reckoning. Two separate log-books were kept, in which the courses and distances were correctly entered; two patent logs were used for the latter. Messrs. Bessels, Bryan, and Meyer, composing the scientific corps, had kept regular watch from the departure of the ship from Tessi-Ussak up to the time when her progress was arrested. They also kept a journal, in which were entered the courses, and the distances (determined by one of the separate patent logs); and this was entirely independent of the ship's log-book kept by the mate. **1871. August.**

No better method could have been adopted for securing all the accuracy possible under the circumstances; yet the difficulties and interruptions in polar navigation are so unceasing and violent that it is impossible to speak of results like these as being anything more than approximations to the truth.

The highest position assigned to the Polaris by Captain Hall was 82° 26′.

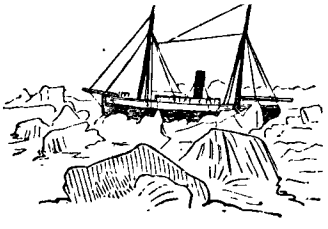
Mr. Meyer, the meteorologist, gave, as the result of his very careful computations, in which all circumstances and allowances were taken into account, the latitude of 82° 16′.

Captain Hall's determination is regarded as more exact by Mr. Bryan, the astronomer of the expedition.

The whole subject has been carefully reviewed at

1871. **August.** the Hydrographic Office, and the result of this revision is that the highest point reached by the Polaris was 82° 11′.*

* See page 96.



CHAPTER IV.

1871. August.

It was impossible to maintain the vessel at this point. She drifted from it with the current. After steaming a few miles to the southward, at 7.30 a. m. of the 30th, she was secured to a large ice-floe for protection. To add to the gloom created by the fog, the snow began to fall, shutting out the view of all objects not very near, even those on board the vessel. The Polaris continued to drift slowly to the south.

At 6.30 p. m.. it ceased to snow. At 7.15, the ice opened somewhat, and the vessel, having cast off from the floe, steamed toward the southeast (true) nearly two miles, and then toward the east about two miles and a quarter. Having made this traverse, she arrived at the eastern shore, in the neighborhood of a small bay which Captain Hall determined to explore. Accordingly, at 8.55 p. m., the engine was stopped, and he attempted to land in one of the whale-boats. He failed in his attempt on account of the large quantity of ice and the rapidity

1871. August. with which it was passing the mouth of the bay. The vessel, after moving a short distance off, was again made fast to a floe. About one hour afterward. at 10 p. m., she started again, and, after moving a little over a mile to the north, another to the northeast, and another to the west, she was again secured by ice-anchors. These rapid movements in different directions were necessary, in order to keep the vessel free. While fast to a floe, and drifting with it to the south, the ice would collect about the hull and close her in. The real danger apprehended, consisted less in the possibility of her being seriously injured by the masses, than in her being thus permanently imprisoned for the winter. To avoid such danger, whenever there was the least opportunity of breaking away from her confinement, the engine was started, and any direction was taken which promised to release the vessel. Soon after the last interruption, a copper cylinder containing a record of the ship's progress was thrown into the water.

On the 31st, snow fell rapidly from 1 to 6 a. m., when it cleared away somewhat. At 6.30, the ship was again under way. After steering a variety of courses, she had made a distance of four and three-quarters miles, when she was within a mile and a half of the shore. Captain Hall renewed the effort of the previous evening to explore the little bay. He was unsuccessful in this second attempt, but ascertained that it was unsuitable

for a harbor. In commemoration of his two defeats, he named it Repulse Harbor. At 9.10 a. m., the ship was headed N. E., and kept at that point until 12 o'clock, during which time the distance run by the log was seven and three-quarters miles. A low island was reported, but its existence is doubtful. **1871. August.**

At noon, the vessel stopped because its further progress was barred by an impenetrable wall of ice. About it large floes were moving, almost covering the surface of the water, and it was only by the exercise of the greatest care that the ship was kept clear. It is difficult to convey in language a correct idea of the scene at this time. Only those experienced in arctic navigation can appreciate the difficulties with which the Polaris had to contend. After the ship was stopped it was evidently useless to attempt to force a passage, at least along the eastern coast of the channel.

The sailing and ice master, Capt. S. O. Budington, urged Captain Hall to seek a harbor at once and go into winter quarters. He had noticed on the way up what appeared to be the entrance to a large bay on the eastern coast, only a few miles south of the present position; and he pressed upon Hall to secure an anchorage there. He insisted that, advance being impossible, it was useless to expose the vessel to the peril of being crushed, or to the risk of losing all the ground, attained with so much diffi-

1871. August. culty, by her being carried to the south with the ice during the whole of the approaching winter.

The question which Captain Hall was thus called upon to decide was one of vital importance. His remarkable success hitherto had excited his ardor, and he could not bear, even under these circumstances, to entertain the idea of retreat. Unwilling to rely on his own judgment, he called a council of the officers, convening them on the hurricane-deck which commanded a view of the situation. He asked the opinion of each in turn, beginning with the least experienced.

Dr. Bessels was of the opinion that it would be much better to reach the western coast, where a passage might be found to the north along the land, and where sledge-traveling in the spring would be more practicable.

The mind of Mr. Chester, the mate, was bent on saving all the ground already gained as the best preparation for sledge-traveling in the spring.

Capt. George E. Tyson, the assistant navigator, whose experience in command of whaling-vessels was second only to that of the ice and sailing master, was then called upon. He had spent much of his time during the voyage in the crow's-nest, and was well posted in regard to the condition of the ice; he knew also the real strength of the ship. His advice was to seek a harbor as

soon as possible, and, if the ice should be driven out of the channel by the wind, to start again for the north. 1871. August.

Captain Budington was the last called upon. He reiterated what he had said to Hall himself. He pointed out the bay, afterward named Newman's Bay, which he wished to have the vessel enter, and enlarged upon the dangers and difficulties to be encountered in forcing her through the pack toward the western shore.

After hearing these opinions, Captain Hall took time for reflection before expressing his own. The belief appears to have been unanimous that it was impossible to advance to the north along the eastern side. There remained but one of two things to do; either to seek a harbor immediately on the east coast, or to run the ship westward. Hall was inclined to take the second course, particularly on account of the opportunity it might afford for sledge-traveling, for progress was the thing nearest to his heart; his hopes had been highly stimulated by his success so far. The first course, that of going immediately into harbor, was recommended by those whose opinions were professional, and were given with an authority that could not be resisted. These were, that the vessel had done what she could; that the western coast could not be reached in the present condition of the ice; that the winter was beginning; that young ice had already commenced forming:—the danger of losing everything

1871. **August.** being so great, a safe anchorage should be immediately secured.

Hall's final decision was to make an attempt to get to the westward, and, if defeated, to seek immediately a harbor on the eastern coast.

During the afternoon, the atmosphere was very clear, and both shores of the channel could be seen distinctly. They appeared to extend to the north for a considerable distance, and then to diverge in opposite directions. The western coast stretched much farther to the north before turning toward the west. Far to the north and northeast, skirting the horizon and extending almost entirely across the open space between the two coasts, was a dark-looking cloud which gave rise to great differences of opinion among the officers of the expedition. Some of them thought that it was a water-cloud, indicating the existence of an open sea to the north. Several persons who were noted for their sharp sight were very certain that at different points along the cloud they had made out the outlines of land. Others again, were inclined to adopt both views, and attempted to point out a difference in the coloring of the different parts of the cloud. Near the horizon, where the darkest shade was, they recognized a water-cloud, while in the lighter portions above, they thought they distinguished a fog-bank. Others of the ship's company contended that it was a fog-bank resting

against a mountainous coast, and that where it occasionally opened they could distinctly see bold headlands. The question remained for many days a fruitful theme for discussion. 1871. August.

It may, perhaps, be well to mention here that these water-clouds form over open spaces of water. A very heavy cloud will sometimes exist over a small opening in the ice, and the conclusion, therefore, that large expanses of water must necessarily be found under water-clouds, is not warranted by the experience of navigators.

Captain Koldewey remarks that the existence of an open Polar sea, supposed to have been seen by several Arctic explorers, is founded upon these very appearances; but hitherto they have proved to be deceptive. They prove the existence of a patch, more or less extensive, of open water, and nothing more.*

But whatever doubt there might be as to the existence of open water to the north, there was none in regard to the space around the vessel. From the mast-head no water whatever could be seen except occasional pools.

The Polaris moved with the greatest difficulty. Notwithstanding the improvement of every possible chance and of every favorable opening, she had made only twelve miles at 4.45 p. m., when the patent logs were taken in.

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*Die zweite Deutsche Nordpolarfahrt in den jahren 1869 und 1870. Erster Band, Erzählender Theil, zweite Abtheilung, Seite 627.

1871. September After struggling bravely for another hour, the ice closed in and barred all further efforts. When finally she was secured by ice-anchors sunk in one of the largest floes, it would have been absolutely impossible for her to move twenty feet in any direction. In these four and three-quarter hours, with all her labor, twelve miles only, as has been mentioned, were traversed, and of these three only were to the north.

This advance placed the ship at 4.45 p. m. in latitude 82° 16′ N.; a result deduced from observations obtained independently of those which had given her position at 6 a. m. of August 30. The latter were determined by dead reckoning from noon of the preceding day; the former started from the latitude of the southern entrance of Repulse Harbor, determined by Mr. Meyer, by a meridian subpolar observation on June 30th of the next year. This reckoning, made up from this subsequent observation, takes into account the courses and distances only without allowance for current or drift. Where so many disturbing causes existed, the effect of which cannot now be estimated, the determination must be received as approximate only.

During the morning, of the 1st of September, a light wind blew from the N.N.E., accompanied by snow-squalls. The vessel continued closely beset by ice. A few detached pools of water were seen to the north and east.

At noon, the snow ceased, but the sky remained completely overcast, while to the north a dense water-cloud was seen apparently nearer the vessel than that observed the day before. Forced by the wind, the ice continued to press closer and closer upon the ship, and the constant grinding against her sides was anything but pleasant. The danger increasing from hour to hour, Hall ordered every man to hold himself in readiness to leave the ship at an instant's notice. The canvas-bags in which the clothing had been kept from the commencement of the voyage for such contingencies, were placed where they could be readily seized upon; other little preparations, such as would occur to no one except under similar circumstances, were promptly made; and all the members of the expedition waited for the issue over which they felt they had no control:—it was in the hands of Him whose constant protection they had hitherto enjoyed. **1871. September**

The ice pressed very hard against the stern of the vessel, and fears were entertained that damage would be done to the propeller. Accordingly the hoisting-apparatus was placed in position, and the screw was lifted into the well which had been built for its reception. Several attempts were made to unship the rudder, but the ice was bound against it so firmly that it could not be moved. It was left to its fate, and preparations were made for supplying its place in case it were carried away.

1871. September The ship, while drifting, had been set by the wind toward the western coast, and a bay was seen nearly opposite which appeared to promise secure anchorage. Captain Hall, taking Mr. Chester with him, crossed the floe to which the vessel was attached, to examine the ice between it and the shore, and to judge of the possibility of making an opening for the Polaris into this bay. The floe was very large, although not the largest of those which impeded and finally closed the navigation of the channel. It was about two miles broad by perhaps three or four in length, and drifted with its narrow end to the south. Its surface was uneven, so that at the distance of a mile, one would be entirely lost sight of while in its depressions, and would be seen only on the elevations. The bottoms of these floes are usually covered with small lakes, formed during the short summer by the melting of the ice and snow. These lakes are frozen solid during the winter, but in the summer and early autumn they reflect the sun from their surfaces and exhibit a variety of colors beneath. Their waters are sufficiently fresh for use when first melted, but after considerable evaporation they cease to be palatable.

When Hall and his party reached the western edge of the floe they climbed some hummocks twenty feet above its average level. They judged that they were within four miles of the land, and discovered, much to

their joy, that the mouth of the bay seemed to be open; also, that with a little management the vessel might reach it from the western side of the floe. They began to return in haste, that they might form an opinion whether there was an opportunity for the ship to round the floe either to the north or to the south. But before they reached the vessel, the open spaces extending toward the bay on the western coast closed up, and the heavy ice again covered the surface of the water. Even if the vessel had been able to round the floe, she could have made no progress toward the bay, her place of shelter. Captain Hall was very much disappointed; he had entertained during his walk strong hopes that the ship would have been before night safely anchored in this bay. **1871. September**

At 7 p. m., a huge berg bore down upon the vessel, piling up the masses of ice before it. A strong easterly wind blowing at the time accelerated its movement, and, driving the smaller pieces more rapidly than the floes, accumulated them about the vessel. She suffered a nip. The pressure was so great that the hawsers, bent to the ice-anchors in the floe, parted under the strain. The ship heeled over, and was almost forced upon the surface of the floe. The ice was piled up to the bulwarks, and the timbers creaked. The ice being twenty feet thick, pressed with such power that there was every reason to expect the most disastrous consequences. Active prepa-

1871. September rations were made for preserving life if the vessel should be destroyed. Stores, provisions, guns, and ammunition were taken from the hold and placed on deck. At 9 p. m., the wind moderated and the pressure of the ice diminished so much that the ship righted; all was quiet during the remainder of the night.

The morning of the 2d, was cloudy; a light wind blew from the northeast, and snow-squalls prevailed. Land was seen through the occasional openings in the thick mist and drifting snow. These glimpses were sufficient to show that the Polaris was being carried rapidly to the south. The chances seemed to be that she would not be released from her icy prison, and would be either destroyed or carried to the south during the whole of the long winter about setting in. It became prudent to prepare for the worst.

It was decided to land sufficient coal and provisions upon the ice to supply the wants of the ship's company during the winter; and to do this immediately. At 2 p. m., all hands were called and set to work transferring the stores from the Polaris to the floe. They were run off on inclined planes and carried a short distance back on the floe by means of sledges. Two sleds were used; one belonged to Hans Hendrick; the other, presented by Mr. Henry Grinnell, of New York, had been used by Lieutenant Hartstene in his voyage for the relief of Dr.

Landing Stores on the Ice Sept. 2, 1871.

Kane. To double the chances of saving something if the ice should break up, two piles of stores were made on the floe at some distance from each other. **1871. September**

At 2.30, the pressure was again felt, though by no means so great as before. A very thick snow-storm added to the gloominess of the scene. Since the danger was imminent the men worked very hard. When the deck had been pretty well cleared and the stores on the ice carefully packed and secured in the two places of deposit, other articles were broken out from below, and placed on deck for immediate use. Having worked until midnight, the crew was sent below to take the rest they had fairly earned.

On the 3d, the wind shifted to the southeast. Snow fell nearly all day in large quantities. The land was rarely in sight, but enough was seen to lead to the conclusion that the ship was still drifting south. The change in the wind had loosened the ice and relaxed the pressure on the ship. The floe to which she had been again fastened turned in different directions. The loose pieces of ice near the vessel also felt the effect of this relaxation, and occasionally opened for an instant.

At 11 a. m., all hands were called to the cabin to attend divine service. Before the service Captain Hall took the opportunity to speak of their work and future prospects. He said that the vessel had reached latitude

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1871. September 82° 26′ N.—a position higher than that attained by any other ship; that they had done all they could, and had only given in to a force that it was impossible to resist; that if it were God's will that the vessel should continue to drift during the winter, they still might be proud of the success already accomplished; that even if nothing more were done, he felt amply repaid for all his labors; and that they might all be proud to return to their country with such a record as they had already made. He assured them that they had no reason for doubting the final accomplishment of their ardently-desired object—reaching the Pole. In conclusion, he urged upon all to give the closest attention to the religious services in which they were about to engage, as, at that particular time, they all needed the assistance of a higher power. Immediately upon the close of these remarks divine service was conducted by Mr. Bryan. Hermann Siemens, a very devout man, thus closes the record of the day: "Ship and crew appear to be a ready prey to the ice. But there is a God, who aids and saves from death; to Him I trust, between these icebergs, although I know that I do not deserve all the good He grants me."

The heavy snow-storm and the southeast wind continued on the 4th, until 2 a. m., when the weather cleared. During the morning the sun made its appear-

ance for the first time since August 29th, but was again obscured before the artificial horizon could be made ready on the floe; and no other opportunity of taking an observation occurred. The atmosphere was comparatively clear, and from the mast-head a considerable portion of the surrounding ice could be seen. From its movement and the favorable aspects of the weather, it was thought that the ice would soon open and free the vessel, giving her another chance to secure a safe anchorage. To be prepared to take advantage of a favorable opportunity, the men were set to work to get on board the stores which had been placed upon the floe. At the end of four hours of active labor, at 1 p. m., the ship was ready to leave the ice. **1871. September**

With a good deal of difficulty the ice was cleared from the propeller-well, and the screw was shipped. At 2 p. m., the wind shifted to the northeast, accelerating the movements of the ice and greatly assisting in opening a passage. At 9 p. m., steam having been raised, the vessel cast off from the floe and began to steam in toward the eastern coast. In a short time she was clear of the ice, and in a channel of open water extending some four or five miles from the land, and "toward the North as far as could be seen from the mast-head."

When the ship started, she was about thirteen miles to the southeast of that cape which forms the southern

1871. September entrance on the Greenland side to the channel from which she had just drifted.

As the vessel approached the land a peculiar smell of burning cloth filled the air. On an investigation ordered by Hall, it proved to be owing to the burning of the felt covering on the little boiler of the engine. Further examination revealed the alarming fact that the feeding cock had been accidentally turned off by the carelessness of a seaman who had hung upon it something to dry. With admirable presence of mind, Engineer Schumann immediately hauled the fires and took precautions to prevent any water from being pumped into the boiler until it had cooled. The safety of the ship was entirely owing to his prompt action. Captain Hall and the ship's company entertained a most grateful sense of their deliverance from a frightful calamity. This escape immediately following their delivery from their ice-bound prison, inspired them with the deepest sense of their dependence on Divine Providence.

Midnight found the Polaris close in to the shore. Hall started in a boat to look for a good anchorage. He landed, unrolled the national flag, and took possession of the land which he had discovered. Upon his return to the ship at 1.30 a. m. on the 5th, the anchor was dropped in ten fathoms of water, about 300 yards from the shore.

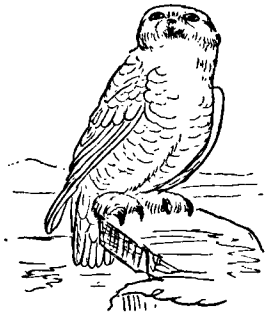
According to the log-book, during the three hours

and a quarter from getting under way at 8.45 p. m. until the vessel stopped at midnight, the course by compass had been S. by E. ¼ E., and the distance made was 13.8 miles. By the position of the ship when anchored (subsequently determined), her place at the moment of getting under way was lat. 81° 32′ N., long. 63° 05′ W.; hence during the four days of drift the vessel had moved to the south a distance of about 48 miles in a direct line. **1871. September**

It was with a feeling of intense relief that Captain Hall heard the rattling of the chain as the anchor was dropped. He was so convinced of his ability to accomplish long distances by means of sledge-journeys that he would have been resigned even if compelled to winter farther south.

The experience of the past few days was by no means pleasant; he frequently called to mind the accounts of those ships which, having been beset, had drifted far to the south during the whole of a long winter. Such an event, which would have put an end to the expedition, was a risk not to be lightly incurred. But not relying wholly upon his own judgment and experience in ice-navigation, Hall again consulted, separately, his sailing-master, assistant navigator, and mate, as to the practicability of attempting to get farther north in the vessel. He came to the conclusion that such an attempt would be injudicious, and this conclusion was strengthened by the

1871. **September** account brought back by the two Esquimaux, Joe and Hans, who had been sent to the top of the cape overlooking the Channel to examine the condition of the ice. They reported that the straits were covered over with a dense fog, completely obstructing the view; but they believed, from many signs which their experience enabled them to interpret, that the condition of the ice in the strait was not materially changed, and that it would be useless to attempt its navigation. The present situation of the Polaris was one of great comfort and relief to all hands. After the ship had been made snug and the watch set, the officers and men went below to make up for past privations of rest and sleep. The next day the crew was set to work transferring stores to the shore. This was done as a measure of safety.



CHAPTER V.

The harbor, which was to be the winter home of the Polaris, was by no means a snug anchorage. It was, however, inside of the line of the main current, and was somewhat sheltered by a bold cape about four miles to the north, and west of the ship's position. This cape forms one of the southern entrances to the strait which had just been discovered. Hall named it after the Secretary of the Navy, to whom he had been indebted for important aid in securing the expedition. He was never weary during the voyage, of acknowledging his obligations to the President and to Mr. Robeson. He thought that to them more than to any others he owed his success, and that, in return for their kindness, he should labor the more diligently to perform the work before him. In the same spirit he named the cape, already mentioned, after his early friend and constant supporter, Col. James Lupton. 1871. September

Besides the immunity from the current-driven ice

1871. September of Robeson Strait, afforded by this cape, there was another source of protection. The Polaris was anchored just inshore of the largest iceberg seen since entering Kennedy Channel. Grateful for this indispensable security, Captain Hall named it Providence Berg. Hermann Siemens gives its dimensions as follows: Length, 450 feet; breadth, 300 feet; and height above the water, 60 feet. Subsequently the name seemed to have been prophetic, for it was the means of saving the ship from destruction, and the members of the expedition from great suffering if not from death.

A large quantity of stores and provisions were landed, in order that, if the vessel should be destroyed by the ice, the crew could live comfortably. A light wind from the northeast blew all day, accompanied by snow-squalls.

At some distance from the shore, to the north and east, rose a high and steep hill, to which was subsequently given the name of Observatory Bluff.

The land, as seen from the ship, consisted of a very broken series of elevations and depressions, interrupted by occasional spurs, which gave variety to the view. The mountain-ranges varied in direction from south to east, and in elevation from nine hundred to fourteen hundred feet. Several prominent peaks made themselves conspicuous in the furthest and highest range. The mountains

1871. September

are composed of an argillaceous schist, the *débris* of which, the result of atmospheric influences, has spread over large surfaces. No depth of soil is met with; not the slightest trace of vegetation, except a few lichens upon the rocks (principally erratic) strewed over the hills. On the fragments of limestone, however, some very luxuriant specimens of lichens were occasionally found.

The *débris* from Cape Lupton reached almost to the sea-shore, leaving a narrow passage only, formed by the ice-foot, which, beginning at that point, extended along the eastern shore of Robeson Strait. The plain was cut by several channels of water running from the neighboring hills to the sea. Bowlders were scattered over the plain in every direction. Fresh-water lakes were seen, affording feeding-ground for birds; also several species of grasses and of Arctic flowering plants. In some few places real soil appeared, and on it the flora of the brief Arctic summer was abundant. Near the water-courses and in the neighborhood of the lakes, constantly liable to overflow, an alluvium had been formed, which, enriched by the birds in great numbers, constituted the garden-spots in this otherwise desert plain.

At this date the snow, which it was evident had fallen during the last few days, covered the land generally. Occasionally were seen in some deep gorge the remains of the last winter's snow, where it had been closely packed

1871. September by the winds and partially sheltered from the continuous sun of the Arctic day.

On the afternoon of the 5th, Captain Hall and Dr. Bessels took a walk down the coast to the southward; they discovered the remains of summer-tents of Esquimaux. These remains are well known to Arctic explorers and have often been described. They consist simply of stones lying on the ground in a circle. The tents are made of seal-skin, and the stones are placed upon their outer edges to keep the skin taut over the ridge, and also to prevent the wind from entering or overturning them. The Esquimaux are accustomed, upon removing from their temporary homes, to take down the pole supporting the tent, and drag the skin from beneath the stones, leaving the latter in position and therefore easily identified as having served this purpose. There were several of these circles near each other, proving that quite a large party of Esquimaux had passed a part of a summer in that place. Nothing indicated the length of time since these tents were occupied. The Esquimaux had certainly been there; for afterward, upon searching closely, several pieces of bone were found with holes bored in them, and a small piece of copper once used as a needle. Among the ashes in the fire-place was found a piece of meteoric iron, by means of which they had obtained fire.

The Esquimaux, Hannah, found most of these

articles, and recognized the purposes to which they had been applied. **1871. September**

Upon the return of Hall to the vessel, he reported that he had seen a bay a few miles south of the anchorage, which he thought would make a better harbor. The anchor was weighed, and the Polaris steamed five or six miles down the coast. Many soundings were taken, but all the little bays were found to be too shoal. During the summer a number of streams disembogue along that coast, bringing down much material and filling up the bays.

Unable to find a suitable harbor the vessel returned; and at 5.30 p. m., resumed her first anchorage. Large flocks of brent-geese were seen sporting themselves in the water, and occasionally a seal would raise his head to watch the intruders upon his feeding-grounds.

The morning of the 6th, brought in a light breeze from the N. N. E., with snow-squalls. The crew were again early set to work transferring stores from the ship to the shore, in which labor they were engaged all day. To expedite their work, two whale-boats, with planks laid across, were employed, and the distance being short the trips were rapidly made, and the ship was soon considerably lightened. Toward noon, the sun came out bright; the instruments were taken on shore, and observations made, for the determination of the position. Captain Hall

1871. September from his meridian altitude obtained for the latitude 81° 38′ N. A careful reduction of all the altitudes taken at this time gave the more accurate determination of 81° 37′. This result was confirmed by subsequent observations.

Immediately after meridian, Captain Hall, accompanied by the members of the scientific corps, started on a walk to Cape Lupton. His object was to reach its summit in order to commence a survey of the surrounding coasts, and to ascertain, by personal inspection, the state of the ice in Robeson Strait. The party was provided with a small Casella theodolite, a pocket aneroid barometer, and a pocket prismatic compass; a rifle was also carried. They walked up the coast toward the north over the snow-covered plain, crossing the gulleys and lakes, winding their way through massive bowlders occasionally found in clusters, and selecting the summits of the little hillocks and edges of the ridges, and generally those places where the snow was least deep, avoiding the valleys, gorges, and other depressions. It was, however, impossible to keep wholly out of the deep snow, because the direction of all the water-courses, of the gulches, and most of the valleys, ran across their path. When the deep ravine, separating Cape Lupton from the range of mountains of which Observatory Bluff is part, was reached, fatigue began to show itself; yet the most difficult part of the journey still lay before them—the ascent

of the Cape. Dr. Bessels became interested in its geological structure, and left the party in order to pursue his investigations among the terraces at its base, and to examine the fossiliferous bowlders of the plain. 1871. September

The best mode of making the ascent was fully discussed. The ravine seemed to be the easiest way, because its ascent was gradual, and, after passing the entrance, the slope of the mountain was less. But it was the longer, and the snow-drifts within it were still too fresh to bear the weight of a man.

The side of the cape directly facing the ship was so steep as to make it very difficult to climb. In the perpendicular side fronting the ravine, however, there was a gorge leading to the top of the mountain. This gorge was narrow and rough, but filled with fresh snow, which would break a fall. It was selected for their route, and the three commenced the ascent in Indian file. For a time the progress was satisfactory, and objects in the plain below, began to appear smaller. Soon, however, it was discovered that the passage was considerably steeper than had been supposed; it became very difficult. The snow, thought to be a few inches deep, was really in some places several feet in depth. Traveling up a steep incline, and wading through snow above the knees, and too loose to bear a person's weight, yet too firm to be easily broken, proved to be much severer labor than had been expected.

1871. September The perspiration flowed freely, and had they not been animated with the spirit of true explorers they would have retraced their steps. When two-thirds of the distance to the summit had been accomplished, Captain Hall left the gorge and sought a pathway to the right, on the edge of the wall of the ravine. His experience in Arctic travels, backed by much personal strength and activity, carried him to the summit, where he was finally joined by his companions, Bryan and Meyer. The point now reached was the southern edge of the mountain, while the real object of their walk was a still higher elevation, nearly a mile beyond, bordering on Robeson Strait. The country to the west and north towards the strait is rough and broken.

On the way, they met with a curious rock formation, which had the general appearance of a house. It was six or seven feet high, with an area of about one hundred square feet, and was the only thing in that wide waste which suggested thoughts of man and of human habitation.

The party had the usual experience of travelers in Arctic regions. The elevation immediately before them seemed to be the end of the journey until it was reached; but on gaining the top another eminence showed itself, and, perhaps, beyond this, yet another appeared. The deception and disappointment in this experience are partly due to the extreme clearness of the atmosphere, which

diminishes the apparent distance, by making objects seem to be near, because they are distinctly seen. In spite of these disappointments the travelers persevered, reaching finally the highest point of the mountain. It bordered on Robeson Strait, of which they obtained an excellent view. The western coast was very distinctly seen as far as Cape Union; beyond that, three peaks only, were observed. The eastern coast was cut off from view by a projecting cape three or four miles above. Between the two coasts nothing obstructed the horizon. It was an ice-horizon on which no water-cloud appeared. The channel, as far as could be seen in both directions, was mostly filled with heavy and closely-packed ice. Immediately under Cape Lupton and about the ship were patches of open water. **1871. September**

After the observations were taken, Captain Hall and his party prepared to return, and found the gorge much easier of descent. At 6.30 p. m., they arrived at the ship thoroughly fatigued, although unwilling to confess it. The readings of the aneroid indicated that their highest elevation had been between thirteen hundred and fourteen hundred feet. The natives during their absence had been successful in hunting, having brought back a seal and four brent-geese.

Early on the morning of the 7th, the wind blew strong from the S. S. W., and brought portions of the pack in

1871. September toward the vessel. At 4 a. m., all hands were called, the anchor was weighed, and the vessel steamed a short distance to the southward, in order to be more fully under the protection of Providence Berg. A great deal of snow fell during the day, forming slush upon the surface of the water, and making the passage of the boats from the ship to the shore very difficult, so that not many stores were landed.

On the 8th, a channel through the frozen slush was opened, and the observatory taken to the shore. The building was made in sections, and could be put up without the use of iron, so that it could be employed in magnetic observations.

The temperature having fallen considerably, during the past few days, and the sleeping-apartments being uncomfortably cold, a stove was placed in the forecastle, and a small one also in the cabin. In consequence of the frozen slush and the nearness of the pack, there was very little open water around the ship. In one of the pools, near the berg, a seal bobbed up its head and played about until it attracted the attention of Hans, who shot it with his rifle. In spite, however, of the best efforts of the men, the body sank before it could be reached.

The channel between the ship and the shore was kept open with difficulty. The dogs, finding the ice sufficiently strong to bear them, surrounded the vessel in

quest of food. The sextants and the artificial horizons, used in observing for latitude on the 6th, had been left on shore, placed securely, as it was thought, in an empty barrel. The dogs overturned the barrel, broke open the boxes, and dragged out some of the instruments, doing, however, no serious injury. To keep them from disturbing the sleep of the crew by their howling, and to provide a better shelter for them, one of the boats was turned up on its side on shore and prepared for a kennel. The next day, the men going to feed them found that the ice had become hard enough to bear their weight. **1871. September**

Notwithstanding the passing clouds, several altitudes of the sun were taken, from which Captain Hall deduced 61° 44′ W. as the longitude of his winter-quarters. The more accurate value subsequently determined was 61° 37′ W.

On Sunday, at 11 a. m., Divine service was held, as usual, after which Hall spoke very encouragingly of the prospects of the expedition and of his continued conviction that he would be able to accomplish his principal object. He added that, in humble recognition of the Divine hand by which the expedition had been guided, he had resolved to name this harbor "Thank-God Harbor." The two Esquimaux went hunting in the afternoon, and Hans brought back an Arctic hare weighing 8½ pounds. On the 11th, Captain Hall announced that the bay discovered

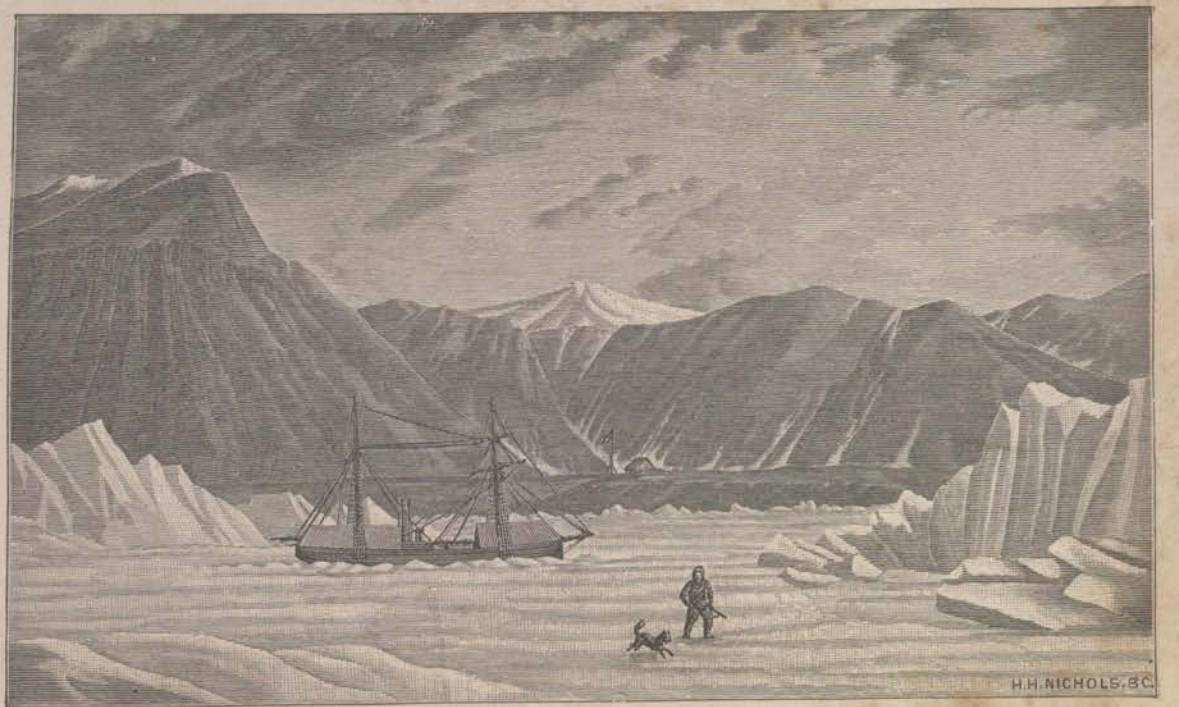
1871. September by the expedition, extending from Cape Lupton to what is now named on the map Cape Budington, should receive the name of the vessel.

Many things had been provided in the vessel's outfit for the entertainment of the crew during the long Arctic winter. To make these available, Hall decided to erect on shore a house for their recreation. It was to be built entirely of boxes and barrels containing clothing and provisions. For transporting the materials ashore, two Newfoundland dogs were harnessed to a sled, and the work of transportation was carried on, in spite of the high wind and the heavy snow-storm.

Messrs. Bryan and Meyer were engaged in local surveys, which, however, were much interrupted by the storm raging on the 12th. The following results are given in their journals: The distance from the observatory to Lookout Mountain was 2.26 statute miles; from the observatory to Cape Lupton, 3.85 statute miles; and to the ship, 962.2 feet.

Hans shot a gull which had exhibited a singular freedom from apprehension, alighting on the ice in close proximity to the ship.

The Arctic day was now becoming more sharply defined in its limits. Up to this time the expedition had enjoyed a very strong twilight during the absence of the sun, but now that twilight was becoming more faint.



The Polaris in Thank-God Harbor, Sept., 1871.

At 3 a. m. on the 13th, all hands were called on deck. The watch had reported that the ice was breaking up. Without knowing what might be the result it was thought best to have every one in readiness. The threatened disruption did not take place until 10 a. m., when a heavy floe broke up the young ice and forced its way toward the vessel. It gave evidence of its progress by the long cracks, extending even to the land, and by its piling up the ice on it. There appeared to be some danger of its forcing the Polaris from her anchorage. **1871. September**

While surveying, Mr. Meyer narrowly escaped a serious accident. He had ascended in a gorge through two-thirds of the way when he came to a perpendicular wall of rock, the height of which did not exceed six feet. Placing his tripod on it, he attempted to climb over by holding on to its rough surface; but when nearly up, the ground under his feet gave way, and he slid rapidly down over the smooth surface of the snow through the gorge. Fortunately he recovered himself before he reached the base, and escaped with torn clothes and a few bruises. He was, however, obliged to renew the ascent in order to gain the tripod, which he dislodged from its place by stones.

Some changes in the internal arrangements of the ship, particularly those for sleeping and eating, were rendered necessary by the approach of winter. The special

1871. **September** object of these was the economy of fuel and the berthing of the whole crew below deck. The state-rooms, being too cold, were given up for sleeping, and Joe and Hans, with their families, were brought down and berthed below. The space was so limited, that it was necessary to set the table twice. But this contraction and crowding together did not impair, in any degree, the sociability and mutual kind feeling which, as is inferred from the journals, existed in the officers' mess. Hall's own temper was eminently social, and his nature was called into play by the congenial circumstances with which he was surrounded. Happy in the prospect before him, he took part as well in the mirthful conversations of the mess as in the serious discussions; he assisted in carrying out harmless jokes. In the amiable rivalry between Captain Budington and the mate, Mr. Chester, as to the merits of their respective towns, he took great interest, not only enjoying the witty retorts of the mate, but helping to draw the whole mess into them. In this intrinsic qualification of an Arctic explorer, the will and the effort to promote cheerful occupation, mutual confidence and regard, he was by no means deficient.

The bull's-eyes of the port-holes were dull, and, in order to have good light during meals, the door of the passage-way was generally left open. This was not unpleasant while the thermometer was above the freezing-point, but it had now become too cold; even with the door shut, the pas-

sage was not remarkably warm. The dishes had always to be brought from the galley on the forward deck. The ruling divinity there, was a colored man named William Jackson. The steward had not encountered much difficulty in carrying the provisions aft, since the anchor was dropped in Thank-God Harbor, and since the dogs had been taken on shore. Before that time, however, it was a very serious matter to be seen on deck with any eatables. Herron was a small man, and when beset by a crowd of the ravenous brutes, he had great difficulty in forcing his way with safety, from the cook's galley to the door that led into the passage. Now that he was freed from the interference of the dogs, he had another and more invincible enemy to contend with, and that was the cold. The cook also found his position by no means a comfortable one, notwithstanding the heat of the galley. To remedy these troubles, as much as possible, Captain Hall gave up his little state-room and moved into one of the berths in the main cabin. Leaving his room for the galley, he hoped that its heat would warm the passage sufficiently to continue its use as a dining-saloon. **1871. September**

Joe and Hans, as the result of their day's work, brought on board late in the evening three fine hares, and reported that they had seen traces of musk-oxen.

On the 14th, the erection of the recreation-house was

1871. September begun, Mr. Chester laying the corner-stone with appropriate ceremonies.

As the shore-line to the southward was low and without distinct features, it was decided to go over the ground and mark such points as were to be included in the survey of the bay. Mr. Meyer had brought some signal-flags and staves, which were used to good purpose as a means of identifying the low projections of the coast. Bryan, Meyer, and Mauch started at 8 a. m. to carry out the plan; their intention being to reach the mountain at the entrance to the southern fiord, which they thought to be about ten miles distant. The more experienced Arctic navigators knew it to be nearer twenty. It rose so high and appeared so distinct against the horizon, that it seemed impossible to believe it was more than ten miles off, and the unexpressed conviction was that it was not more than six or eight.

On their way down the coast, many flags were placed on the projecting points of the extensive plain, some thirty or forty feet above the sea-level. After lunching on a few Graham crackers, the party started to cross Polaris Bay on the ice, in the direction of Cape Tyson. The ice proved to be much broken, with many hummocks, so that rapid progress was impossible. A gull was the only living creature seen. It approached quite near, circling over their heads while they were planting the staves. After four hours' travel over the rough ice of

the bay the cape seemed still as far off as when they started. Convinced that they could not reach it before night closed in, the party returned to the ship. 1871. September

The natives, who had been absent all day, hunting on the land, had found no game, but had again seen recent tracks of musk-oxen. Hall was gratified to learn this, for its promise of fresh meat. No one knew better its value as an anti-scorbutic. The day had been remarkably pleasant, but late in the evening a southerly gale set in, which drove the pack in toward the ship. The newly-formed ice, as if endowed with life, rose into hummocks and cracked into pieces, which piled themselves on each other. The formation of hummocks in this way is curious, and worthy of observation. Under a severe pressure, an expanse of young ice may not crack, but in many places rise up, as though acted on by some local force below, and afterward break, leaving large slabs about the place of fracture.

Providence Berg afforded great protection to the Polaris; but at one time, during this day, the ice pressed so hard against her stem, as to endanger the cable leading over the bow to the anchor. The cable was paid out. The wind lulled at 6.15 a. m. of the 15th, and the ice-pressure ceased.

It snowed during this day. The men were employed perfecting the arrangements for the winter, and at the

1871. September same time preparations were made for a hunting-party to start on the following Monday on a long hunt for musk-cattle.

At 9 a. m. of the 16th, Bryan, Meyer, and Mauch started again on a tramp to the south, to complete the work commenced on the 14th.

They measured some angles at the places previously marked, eating their lunch under the lea of a large snow-bank, while the wind was blowing briskly from S. S.W.

Guided by former experience, instead of crossing for Cape Tyson they directed their steps toward a mountain farther east, with the intention of following thence the coast-line to the entrance of the fiord. They found the ice of the bay very rough, besides which in some places there was considerable depth of snow. They began to discover that Captain Hall's estimate of the distance of the mountain was much more accurate than their own. After much toiling they reached the shore at 6 p. m. Ascending the plateau about forty feet above the ice, they found it was broken ground to the base of the mountain, distant about half a mile. Cape Tyson was still nearly four miles off. It was determined to end the base line here instead of at the Cape, in order to make the best of the remaining day. This base was twelve miles long and was sufficient for the protraction of the opposite coast. The high wind gave them a great deal of trouble, and

added to the labor and difficulty of their work. On its completion, the party started on a direct line for the ship, not taking into account the effect of the high wind upon the ice in the bay. 1871. September

Two of them, Bryan and Meyer, wore Esquimaux foot-gear, being otherwise dressed in their ordinary clothes. These skin boots and stockings, besides keeping the feet warm, are light. But Mauch wore a pair of cow-hide boots, too large for him, and very heavy. Darkness overtook them on their way, increasing their difficulties and danger. They soon tired of climbing over the hummocks and wading through the snow. At such a moment the close quarters and other discomforts of life on shipboard are forgotten, and the warmth and light of a little cabin are remembered with pleasure. They could not see the ship, and, to judge of the progress made, they occasionally looked back at the mountain, they were leaving, in hopes of seeing it grow lower and dimmer. It would not leave them, but rose high and drear, as plain to the sight as at first.

The effect of this was distressing. Fixing their eyes on an iceberg ahead they determined not to look back until they had passed it; they then turned to see the effect of their progress on the mountain. Yet it still seemed to stand above their heads no less distinct in outline, and no less gloomy than before. There was no get-

1871. **September** ting away from it. This produced a state of mental depression which lowered their spirit, and impaired their strength.

They toiled over the dreary waste with mechanical effort. Bryan and Meyer, having the advantage of light foot-gear, and perhaps of greater endurance, advanced more rapidly than Mauch. Fearing to leave him alone, whenever they had lost sight of him, they waited for him to come up. They had not been long upon the ice before they discovered that the wind had seriously affected its condition. Numerous cracks appeared, to cross which in safety required the utmost care. To increase the difficulty, the wind, which continued to blow very strong, carried with it a large quantity of light snow, making the detection of cracks very perplexing by blinding the sight or actually covering them with the drift. Notwithstanding all their caution, Meyer fell into a crack, but extricated himself before the water had reached much above his knees. Not long afterward, Bryan attempted to leap over a crack, in spite of Meyer's warnings that the opening was too wide and the opposite side was not solid. He found himself up to his shoulders in water, when, being rescued with the assistance of Meyer, he crossed over at a narrower opening. They were at this time not quite half way to the ship, and the prospect of remaining so long in their rapidly-freezing clothes was

by no means pleasant. Mauch still lagged behind, and again they once or twice waited for him. If remaining stationary was, before this, uncomfortable on account of the cold and the high wind, it now became positively dangerous; their wet state demanded that they should lose no time in reaching the Polaris. **1871.** **September**

Mauch fared no better. He fell in up to his waist; and afterward, as he expresses it in his journal, "was compelled to take the temperature of Polaris Bay twice more." Finally, however, they all reached the shore, which, on account of the broken and unsafe condition of the ice, they made for, sooner than they would otherwise have done. Their clothing was by this time frozen solid, and their hands were encased in mittens of ice. The Esquimaux boots, being water-tight, retained all the water entering them over the tops which had not been properly secured. In walking, it rose and fell; though by no means comfortable, it was thus prevented from freezing. On their reaching the land the ship was still three or four miles distant; the remainder of the walk was dreary enough.

Satisfied that Mauch could get along very well on land, Bryan and Meyers pushed on to the ship. Walking in frozen clothing is difficult, and this, added to their weariness, delayed them so much, that it was one-half hour after midnight when they reached the vessel. Captain

1871. September Hall had begun to feel very anxious, and was about organizing a relief-party when the two appeared. Eager inquiries were made for Mauch. Morton and Herman Siemens at once prepared themselves and started in search of him. They found him quite near the vessel, much exhausted, rolling about like a drunken man, and scarcely having any consciousness left.

The officers manifested much interest in the accounts given by the travelers. As soon as Bryan reached the vessel he gave way, and did not recover his consciousness until he had been undressed and had lain some time in his bunk. Opening his eyes, and seeing the captain and several of the officers watching him, he said very slowly, "Captain—traveling—in—this—country—is—very—discouraging." This remark was greeted by rounds of laughter, and doubtless his conclusion was fully justified by his late experience. Probably the laugh was due quite as much to the relief afforded by his return to consciousness as to the aptness of the remark.

After divine service, Captain Hall announced that he had appointed William Morton yeoman, with J. B. Mauch as assistant. Mauch had been selected by Hall, September 7, as his clerk, and had proved himself well qualified for his duties. In speaking of the approaching winter, Hall exhorted the members of the expedition to preserve friendly relations with each other.

Early in the morning of the 18th, a hunting-party, conducted by Mr. Chester, left the vessel in search of musk-oxen. Dr. Bessels accompanied Mr. Chester, for the purpose of making a geological exploration and of collecting specimens in natural history. The two Esquimaux, Joe and Hans, were added to the party as dog-drivers and hunters. A sled drawn by eight dogs carried the tent, sleeping-bags, and provisions for seven days. **1871. September**

A fire-hole was cut in the ice near the Polaris for the supply of water in event of fire.

The next day the wind blew so high that it was found necessary to brace the observatory with planks.

The North Star was seen on the 21st, for the first time since the establishment of winter-quarters. A large halo was observed encircling the sun.

On the 23d, Captain Hall extended the duties of a board which had been previously appointed to make a list of the articles stored on shore, ordering them to embrace in their survey everything belonging to the expedition. The stores were taken out of the hold, and, after lists of them were made, restored to their places. An awning had been prepared to cover the deck of the vessel during winter. The forward part of this was now put in place. It afforded a perfect protection to the deck.

There had been for several weeks dissatisfaction among the men on account of the quality of their food.

1871. **September** the summit of a small hill not far from their tent. The dogs, being loosed, soon brought the animal to bay, and the four hunters with a few shots killed it. It was very fat, the whole animal weighing three hundred and sixty-nine pounds. It was the only one seen during their hunt, and, with the exception of a few hares, was the only thing killed. The musk-ox had never before been met with on the western coast of Greenland, although Dr. Kane found parts of a skeleton near Rensselaer Harbor. Many were killed on the eastern coast by the second German expedition (Koldewey's).

Captain Hall was anxious to make a sledge-journey before the winter set in, for the purpose of reconnoitering and of selecting the best route for his great journey in the spring toward the Pole. He was very much disappointed to learn that there was not enough snow upon the plain for sledge-travel, but was determined to carry out his designs, even if he should be compelled to go over the bare ground. He ordered the carpenter to construct a wagon for the transportation of the necessary provisions. A ship-carpenter is expected to be able to manufacture anything, and accordingly Mr. Coffin, without hesitation, began to frame the wheels.

Bryan and Meyer were continually engaged in the survey of the bay and its surroundings, making frequent and long excursions for this purpose.

Killing the First Musk-Ox, Sept. 19, 1871.

On the 27th. a severe gale from the southwest drove the pack in toward the vessel and cracked the young ice about it. The ice near the shore was thrown into immense hummocks; and large packs were formed on either side of the ship. Providence Berg, however, held its ground. The young ice which had formed around the vessel was measured, and found to be about sixteen inches in thickness. The pressure by the storm-driven pack was so great, that the ice broke like glass. **1871. September**

On the 28th, final preparations were made for Captain Hall's proposed sledge-journey. The dogs were selected and carefully fed. The Esquimaux put the sled in order and examined the harness. The heavy snow-storm prevailing during a part of the 27th, and during the next morning, excited hopes that the sled could be used. Those who were selected to accompany Captain Hall were busy making their personal preparations. Large knives, such as are used in cutting blocks of snow to make "igloos" (Esquimaux snow-huts), were provided; suitable provisions were stowed in bags, so as to be readily accessible. In this preparation the dogs were not forgotten. Duplicates of perishable articles were also furnished.

From noon until 3 p. m., the ice-movements again threatened the destruction of the Polaris. The high spring-tide, in connection with a strong breeze from the S. W., brought the pack in against the berg with great

1871. September power. The ice was piled up about the vessel in all manner of shapes. The berg, which had hitherto steadfastly maintained its position, moved in toward the shore. The ice between it and the vessel was broken by long cracks and raised into hummocks. The pressure brought upon the ship was very great, as was apparent from the strain upon her frame; and the effect of this pressure was seen in its action upon the inside ice, masses of which were thrown up on the shore. It was necessary to veer the cable. If the vessel had not been perfectly strengthened and fitted for this service, she would have been crushed. When the pressure ceased, it was found that the berg had been forced in toward the shore 100 yards, and the ship 50 yards.

There was a great deal of snow during the next two days; the wind shifted to the north, and a channel of water was formed between the floe and the loose pack of the strait, at a distance of about three quarters of a mile from the ship.

On the 30th, a tidal apparatus, similar to that used by Dr. Hayes at Port Foulke, was erected over the fire-hole, and regular observations were commenced.

After Divine service, October 1st, Captain Hall made known certain rules which he intended to establish. They referred particularly to food, light, fuel, and exercise. Thereafter only two meals were to be served, one at

9 a. m., the other at 3 p. m. The remainder of the rules related to the ordinary routine of a ship. **1871. October.**

An inspection of the stores led to the discovery that the supply of oil was limited; the idea of the recreation-house was therefore abandoned and it was taken down.

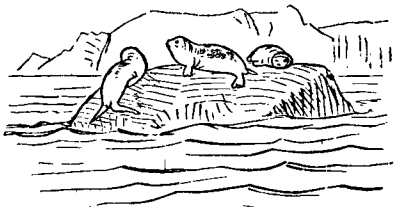
The stores under the hill in the snow-drifts were carried to the plateau on which the observatory stood.

Some changes also were made in the lower cabin, enlarging the central space (or country, as it is called), making it suitable for a dining-room if it should be necessary to abandon the passage.

The two Esquimaux were out hunting daily, skirting the edge of the floe, and making every effort to shoot the seals constantly seen in the open water. They were unsuccessful until the 5th, when they shot two, one of which they were able to secure. After having observed them closely, they were convinced, by the shyness of the seals, that a tribe of Esquimaux lived in the neighborhood.

On the 6th, Captain Hall said that he had heard one of the men cursing another. Severely condemning the expressions, he issued an order forbidding all profane or vulgar language. Six of the men, taking with them the small scow, so as to be able to secure the seals that might be shot, before they were carried off by the ice, accompa-

1871. October. nied the natives on their hunt. During the whole day one seal and a white fox were seen, both of which escaped uninjured.



VI.

CHAPTER VI.

At morning prayers on the 10th, Captain Hall announced his intention of starting that day upon a sledge-journey, and in the course of the day he issued the following letter of instructions: **1871. October.**

"SIR: I am about to proceed on a sledge-journey for the object to determine how far north the land extends on the east side of the strait on which the Polaris is wintering, and also to prospect for a feasible inland route to the northwest for next spring sledging in my attempt to reach the North Pole, this route to be adopted providing the ice of the strait should be found so hummocky that sledging over it would be impracticable; and furthermore to hunt musk-cattle, believing and knowing, as I do from experience, that all the fresh meat for use of a ship's company situated as is that of the Polaris, should be secured before the long Arctic night closes upon us.

1871.
October.

"INSTRUCTIONS.

"You will, as soon as possible, have the remainder of the stores and provisions that are on shore taken up on to the plain by the observatory, and placed with the other stores and provisions in as complete order as possible. You will have each kind by itself, as near as may be. You will have the ship's housing (winter awning) put up as designed.

"Have the night-watch kept up in accordance to my winter instructions of September 23d, with simply this change, that the watch is to be continued until the cook commences his morning work. Have every light in the ship extinguished at 9^h p. m., except from this hour a candle-light is to be allowed forward, for the use of the watch.

"You will see that no more coal is consumed in any stove of the ship than is actually necessary. I find by thermometers placed in the men's quarters forward and both cabins aft, that the temperature of the air is kept far higher than it should be, both for economy in the consumption of coal and for the health of the ship's company, the thermometer through the day and evening ranging from 60° to 70°; therefore you will require no more coal shall be consumed than is necesary to keep the thermometer, forward and aft, at 50° through the day and evening.

"A very small fire to be allowed forward to be kept up from 9h p. m. through the night, but the one aft to be discontinued at 9h p. m. 1871. October.

"Have the dogs well cared for, feeding them every other day. Look out some good warm place in the ship for the puppies, and have them well nursed.

"Have Mr. Morton get and open one can of pemican, and deal that out economically to the puppies. I have great hope of securing many musk-cattle on my sledge-journey, and then we can spare much of our ship's provision to the dogs.

"Should any such calamity be in store for the Polaris (which I pray God may not be) that a storm from the northward should drive the ice out of Thank-God Harbor and the Polaris with it during the coming spring-tides, then have steam gotten up as quickly as possible and lose no time in getting the vessel back to her former position. But should the Polaris be driven into the moving pack-ice of the strait, and there become beset, and you should not be able to get her released, then, unfortunately, the vessel and all on board must go to the southwest, drifting with the pack; God only knowing where and when, you and the ship's company would find means to escape. * It might in this case be that such a drift movement would occur as in the case of the United States Grinnell Expedition of 1851–52, and of the Fox, under

1871. October. "McClintock, in 1857–58; but whenever you should get released, if anywhere between Cape Alexander and Cape York, or between the latter and the Arctic circle, you will then make your way to Godhavn, Disco Island, and if the Polaris remains seaworthy, you will fill her up with coal, stores, and provisions, and next fall (of 1872) steam back to this place. If the vessel should become a wreck, or disabled from the imminent exposure and dangers of such an ice-drift as referred to, then all possible use of your best judgment must be brought into play for the preservation of the lives of all belonging to the expedition.

"You would, at your earliest moment of escape, acquaint the Government of the United States with the whole of the circumstances, and should one of those circumstances be the loss of the Polaris, I and my small party, that is about to accompany me on the proposed sledge-journey, would remain here to make discoveries to the North Pole, using Thank-God Harbor as our head-quarters, and all the time feel certain that our country would lose no time in sending us aid, in carrying out the great object of the present expedition.

"Although I feel almost certain that the Polaris is safely lodged in her winter position, yet we know not what a storm may quickly bring forth. A full storm from the south can send the pack of the strait infringing upon the land pack, in the midst of which we are, and in a few

"moments cast the Polaris high and dry on the land. During the spring-tides let great vigilance be exercised, especially during any gale or storm at the time of high tides. **1871. October.**

"As soon as time will allow, have snow-blocks cut from the drift under the lee of the hill by the observatory and sledged over to the Polaris, the same to be placed about her as an embankment.

"You will have plank and boxes so placed under the poop that the dogs cannot get to the raw-hide wheel-ropes.

"The usual routine of the ship that I have established will be gone through with, daily, during my absence. You will see that this is carried out, including church-service on each Sabbath.

"The duties that devolve upon Mr. Morton by my appointment are those of paymaster and yeoman. He has full charge, under my directions, of all the accounts, stores, and provisions on board the Polaris and on shore belonging to the United States. Whatever relates to the consumption and use of said stores and provisions, Mr. Morton has charge of, and will be made responsible for the same. I am sure this trust that I have committed to Mr. Morton will be carried out with fidelity and to the best advantage of the United States Government and this, its North Polar Expedition.

1871. October.

"All the fuel, kindling, and coal, before being used, must pass through the hands of Noah Hayes, who must keep an exact account of the same, which he must render to Mr. Morton, or he may render the account to the chief engineer, and the latter to Mr. Morton.

"No box, barrel, package, or anything else containing stores or provisions belonging to the Polaris must be opened, but by Mr. Morton. This as well as all other orders that I have issued, you will have carried out.

"You will keep a journal of all proceedings during my absence, and transmit the same to me on my return. You will not omit to note such violations of orders that are or may be given, and by whom they are made; neither will you omit to note the meritorious conduct of any or all.

"Hoping that God will protect you in the discharge of the high duties which devolve upon you, I bid you adieu and all those of my command, trusting on my return to find *'All's Well;'* and trusting, too, that I shall be able to say that my sledge-journey, under the protection and guidance of Heaven, has been a complete success, not only in having made a higher northing, a nearer approach to the North Pole than ever white man before, but that a practicable inland sledge-route far north has

"been found, and many musk-cattle have been seen and captured. 1871. October.

"I have the honor to be, your obedient servant, and respectfully,

"C. F. HALL,

"*Commanding U. S. North Polar Expedition.*

"To S. O. BUDINGTON,

"*Sailing and Ice Master,*

"*U. S. North Polar Expedition.*

"THANK-GOD HARBOR (latitude 81° 38′ north; longitude 61° 44′ west), October 10, 1871."

The persons selected by Captain Hall to accompany him were Mr. Chester, Joe, and Hans. The start was made at 1 p. m. The one sled was heavily loaded, and although the team was a large one consisting of twelve or fourteen dogs, it was necessary to obtain the assistance of the men who were working among the stores on shore to pull the sled up the hill and through the deep snow for a distance of about a half of a mile. At the separation, three hearty cheers were exchanged. The next morning Hans returned to the ship for another sled, more dogs, and a few small things that had been forgotten. Hall had found the traveling very heavy, and had not been able to make a distance of more than five miles. They waited in an igloo for Hans's return.

On board ship, during the next few days, all hands

1871. October. were set busily to work preparing for winter. The awning was housed—that is, it was stretched so as to cover the whole deck—and snow-blocks were cut to make a wall around the hull. The water in the tanks having been used, recourse was had to ice. Some of the small pieces in the harbor were fresh-water ice, but the chief supply came from Providence Berg, which was only about three hundred yards from the vessel; the labor of sledding the ice from it was not great.

The engineers attempted to make some arrangement about the galley-pipe for melting ice, but were unsuccessful. Experience showed, however, that an ample supply of water could be obtained by the use of temporary boilers on the galley and the heating-stoves.

At meridian of the 16th, the upper limb of the sun was seen for a short time above the tops of the mountains; the next day it did not appear. The mountains had an elevation of about $1\frac{3}{4}$ degrees. The long Arctic night had commenced; for one hundred and thirty-two days they would look in vain for the return of the sun.

Hitherto, the strait seen from the shore had continued open, the heavy floes moving up and down under the influence of the winds and currents. For a few days previous to the 23d, very severe winds prevailed from the north, driving the ice off from the land and leaving quite a large expanse of open water. At times this was cov-

ered by a dense water-cloud or frost-smoke, concealing the opposite shore, and rendering it impossible to see the ice in the strait, or to determine the breadth of the open-water space. , The temperature had varied from a few degrees above zero to eighteen below. **1871. October.**

At 1.30 p. m., on the 24th, the sledge-party was discovered making its way over the plain, on its return, and at 2 p. m. it reached the vessel. Captain Hall and his companion were at once surrounded by a group of cheerful faces anxious to hear the news.

The principal circumstances were soon communicated. They were all well, and had been well during their two weeks' absence, excepting Captain Hall, who had complained that he did not have his wonted vigor and endurance; and during the last three days had not been feeling at all well. He had frequently, during the journey, expressed his surprise that he was not able to run before the sleds and encourage the dogs, as on former expeditions, but had been compelled to keep on the sled.

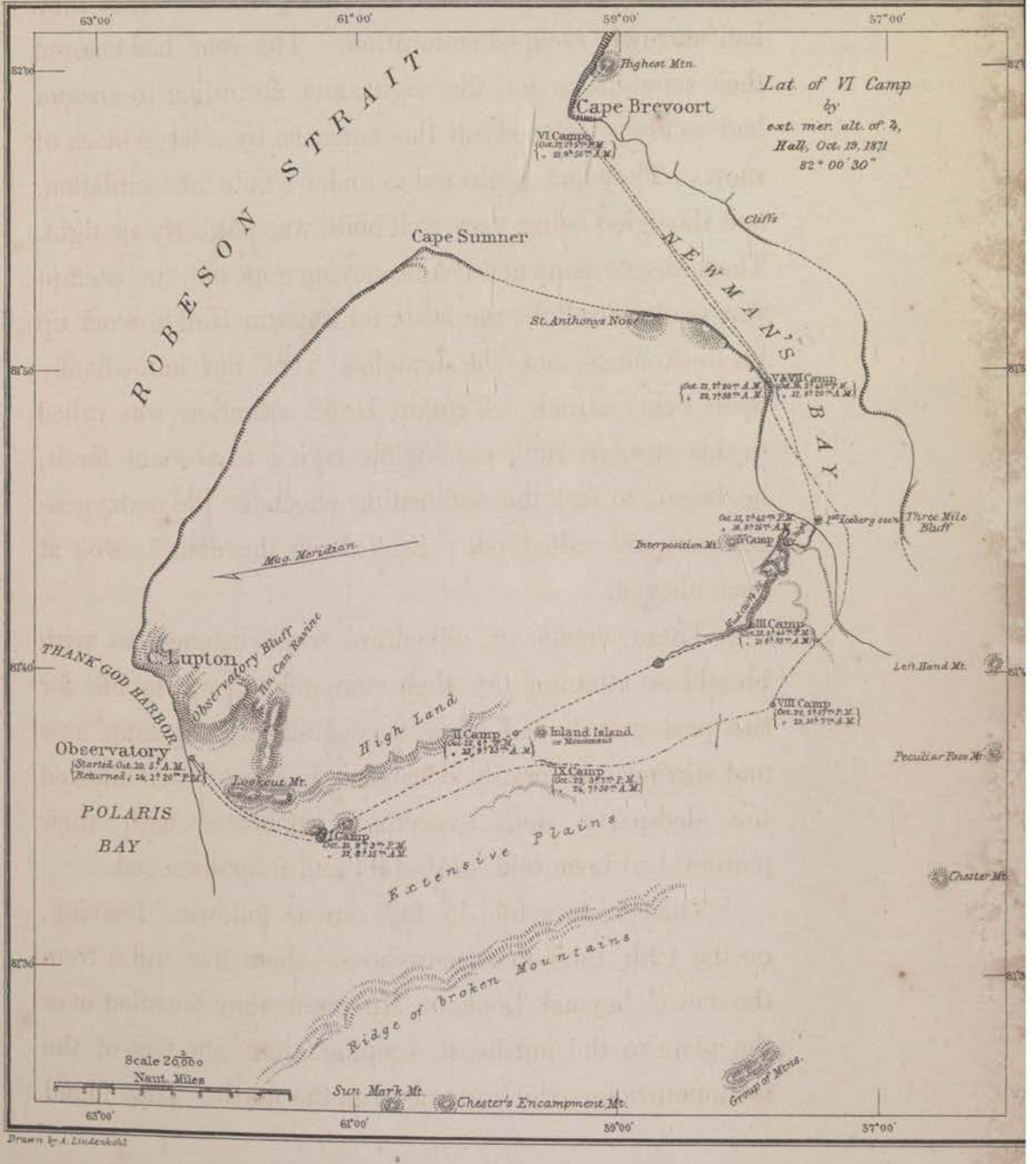
Although the Esquimaux had fired at several seals, they had been without success in securing them. Traces of musk-cattle, of foxes, and of lemming, together with an owl and a few hawks, had been seen. A large litter of pups had been devoured by the dog-team as soon as born. The party had slept every night in snow-houses erected at different places, in one of which they had

1871. October. passed a whole day on account of the severity of the wind and the blinding force of the drifting snow. Once they had narrowly escaped suffocation. The four had entered their snow-house for the night, and according to custom had securely fastened up the entrance by a large block of snow. They had neglected to make a hole for ventilation, and the igloo being very well built, was perfectly air-tight. The kerosene lamp and candle having gone out, an attempt was made to relight the latter for Captain Hall to work up his reckonings, but the matches went out immediately upon being struck. Captain Hall's attention was called to this strange fact; and while trying to account for it, he began to feel the suffocating effects of the deoxygenated air, and called out "Kick down the door." Joe at once obeyed.

These details of adventure were listened to with breathless attention by their companions, whose life for the past month had been very uniform; anything new and stirring was greatly relished. Little rest was allowed the sled-party until everything connected with their journey had been told and retold and fully discussed.

Their history told in full ran as follows. Leaving, on the 12th, their first snow-house about five miles from the vessel, beyond Lookout Mountain, they traveled over the plain to the northeast, keeping along the foot of the mountain-range which guards it on the north. They found

TRACK OF HALL'S LAST SLEDGE JOURNEY



Drawn by A. Lindenkohl

the snow very deep, and encamped at night near a remarkable hill which rose abruptly and stood alone. Captain Hall thought, and no doubt correctly, that this plain once formed the bed of a river, the hill at that time being an island; he named it the Inland Monument or Island. At noon of the 13th, about one-quarter of the sun's disk appeared above the glacier which covered the mountains to the south. As the few rays of the sun fell upon the ice between two mountains a beautiful phenomenon was witnessed: the parhelia glowing with the colors of the rainbow. From the sun rose a vertical column of red rays to a height of 15°. This was the last look of the sun,—not again to be seen for four months; it was the final ray thrown back by the luminary upon the lamented Hall seeming to leave with him a parting benediction. **1871. October.**

At 1.30 p.m., a small lake was discovered, from which ran an icy river in the direction in which they were going. As the traveling upon its smooth surface was good they resolved to follow it, and soon found themselves wandering in the irregular sinuosities of a ravine. Following the course of the river for about one hour, they encamped upon it for the night. Hans cut a hole through the ice and found water, which was a source of satisfaction since much time and fuel were saved by their not being compelled to melt ice or snow.

On the 14th, just as they were about to breakfast

1871. October. an accident happened which put an end to their immediate progress. Mr. Chester, in taking the kettle of boiling coffee from the little stove, or *conjurer*, as it was called, found the iron handles too hot and dropped it. Portions of the contents were dashed into his face, scalding him very severely. Prompt applications of "cosmoline" brought immediate relief.

The following is an extract from Hall's journal, written on this journey after having retired in the snow-house for the night:

"We have just finished our supper, or tea—a two-pound can of preserved meat and vegetables, hard bread, and raw pemmican—and now feel just as well as though we had been feasted by a New York City Alderman. Our standard provision is raw pemmican, the most condensed and most nutritious of all food. The pemmican we have is the very best I ever ate; indeed, I believe none was ever made by a more honest hand than the hand that made this, Mr. Marshall P. Smith of Baltimore, who is president of the National Preserving Food Company of Baltimore. Ten thousand pounds did he supply to the Government for the North Polar Expedition.

"This afternoon I took a walk down the river, to see if it was feasible for us to follow it; after keeping along its course for a little over a mile I ascended its right bank, or eastern side, and then also ascended the hills along its

"border, and from the summit of these I could see the course for two miles farther, the general direction being about northeast. I then walked a little way inland, away from the river-bank, taking sharp looks for musk-cattle. My view was quite extensive, but I was not fortunate in seeing any. The banks of the river are very much broken and irregular, but in many places cliffy. The cliffs are found twenty-five to seventy-five feet high, and are composed of mud—frozen mud. The nature of the land has the appearance of drift-shingle schistose. Lime and slate predominate. I found one large bowlder of gneiss, which, of course, is erratic. Most of the stones are rounded, as if sea-washed. Now and then pebbles of granite are found, which, of course, like the gneiss, do not belong here. There is not a sign of vegetation on these hills, save now and then a bit or tuft of grass. Looking to the eastward, I am inclined to think an extensive level country is there. It may be that there we might fall in with musk-cattle, for on the plains considerable grass and other vegetation abound, as we have seen on the plains we have passed over in getting here. Luxurious lichens are to be seen on rocks here and there."

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On the afternoon of the 15th, Hall encamped in sight of what proved to be a bay. The ice covering it was, as far as he could see, smooth, broken only by a few icebergs. Reaching the bay the next morning, he di-

1871. October. rected his course northerly toward its mouth. The snow upon the surface of the ice was only four inches deep, but owing to its having a thin crust upon it, which broke under the weight of the dogs and sledges, the traveling was as difficult as if the snow had been soft and much deeper. The feet of the dogs became very sore, and they were unable to travel very fast.

The fifth encampment was made on the southern coast of the bay. Here, not being able to obtain any fresh-water ice, he chose, in preference to snow, some old sea-ice, which by age had lost its salt.

On the morning of the 17th, Captain Hall made the following record: "This morning read prayers; the beautiful and appropriate one of Dr. Newman's, designed for the use of sledge-parties while away from the ship, traveling toward the North Pole. All listened to its impressive sentiments." Dr. Newman, at the request of Captain Hall, had prepared three prayers for use on the expedition, which were printed in small books, for circulation among the men. These forms were frequently used at divine service on Sundays and at daily morning prayers. Becoming dissatisfied with that arrangement, and thinking that no exact form of words could express the particular wants and desires of each occasion, and that the men did not take much interest in the exercise when they knew exactly what would be said, Captain Hall had per-

suaded Mr. Bryan to offer extemporaneous prayer. He favored also extemporaneous speaking, and had frequently said that before the winter was over the written sermons must be laid aside, and the Sunday discourse be delivered without notes. **1871. October.**

The traveling was very good on the 17th, and fair progress was made. An attempt to reach the cape at the northern entrance of the bay was begun; but when within a half mile of it open water was met, which rendered a stop necessary. So many icebergs had been stranded here that it was impossible to advance with the sled; it was determined to make the sixth encampment. Captain Hall in his journal says: "The pack fills the straits to which we have arrived, and is on the move, impinging on both the south and north capes of our bay, and thus we are prevented extending our sledge-journey along on the shore-ice, as I had hoped to be able to do. Obstacles have come and may continue to come, but they must be surmounted. Skirting the shore toward the North Bluff Cape are high, irregular, broken hills of shingle, which have been formed by the pack-fields of the straits pressing icebergs on shore, which, on grounding, turn up the sea bottom."

The open water occupied a small space at the mouth of the bay, and many seals were seen. The fast ice of

1871. October. the bay ended in a curve from cape to cape, with its concave side toward Robeson Strait.

The drifting masses in the channel swept past the opening, a few small pieces only entering the bay. Joe and Hans lost no time, after the igloo had been constructed, in going to the water's edge with their rifles to secure, if possible, some of the seals. Hiding behind icebergs and hummocks, they soon had opportunities for shooting. They killed several, but were unable to secure the bodies; the eddying current carried them away. With kyaks, many might have been taken.

On the 18th, Captain Hall, accompanied by Mr. Chester and the Newfoundland dog Wolf, walked to the top of the cape. The incidents of the trip will be given in his own language: "Starting from the encampment at 9 a. m., we followed a gorge, having a general N. N. E. direction, for half a mile, and then, turning to the left, ascended its side. This was the first place met where it was possible to make the ascent. On the summit was a huge old bowlder, 12 feet high, which, before the fractured end had been severed from the parent rock, measured 25 feet in length. On the sides and top of this mass of limestone lichens abounded. Upon our arrival at the cape, I proceeded to take bearings. As it was evident that considerable time would be consumed in making these observations, I allowed Chester to take a walk by himself, sup-

"posing that he would soon return. I found that I had undertaken a more difficult task than I had anticipated. There was a smart breeze from up the bay, and as I stood in an exposed position, it was cuttingly cold. When I had completed my work, I looked eagerly around for Mr. Chester. Where was he? My shouting, screaming, roaring, met with no response. I became greatly alarmed, thinking that he might have fallen down and by a mishap struck his long snow-knife into his side. I was able to track him by the occasional patches of snow down into a deep ravine. Losing his tracks, I followed the ravine, still searching, until it made a deep plunge. I started to return, and, on my way, found a rock full of fossils, coral being one of them. While engaged in examining these, I heard Chester shout, and, looking about, saw him and dog Wolf on the opposite—that is, the north—side of the ravine. As in that direction lay a high mountain which I wished to ascend, I retraced my steps and made my way out of the ravine at the first accessible place I met. We then moved on toward our point of destination. We were soon obliged to cross another ravine, and, upon reaching the summit of one hill, we found that a still higher one arose beyond us. We persevered, however, and finally reached the highest point of all. On our way, grass and various species of flowering plants were seen, and they abounded even up to the mountain's top."

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October.

1871. October. Reaching the summit, they had an extended view of the channel and the land on either side. The former was covered with ice, which, from Hall's elevation, did not look very rough. He entertained the idea that the snow, falling during the winter, would drift among the hummocks, and, filling up all the crevices, would harden, and afford by spring a smooth surface for sledge-travel. The land on the west side of the channel ran to the north and east until it appeared to end in a cape, nearly due north, distant about sixty or seventy miles. It then turned to the west very abruptly. The east coast ran to the northeast for about ten or twelve miles, when it turned to the east and disappeared. A cloud was seen extending across the straits, far away to the north and east, similar to that observed from the vessel when near her highest latitude. Hall could not determine whether it was a water-cloud or the loom of land. It was broken in several places, indicating a prominent headland with islands around it. After a walk, made interesting by geological observations, the party arrived at their snow-house at 4.35 p. m.

The next day Captain Hall, following the shore-line, rounded the cape, but was unable to go very far, as its perpendicular sides were encroached upon by a moving floe. He spent much time in surveying and examining the surrounding country, and finally came to the conclu-

sion that he had reached the end of his journey. The land which lay to the north and east of the bay was high and little adapted for sledge-travel, on account of deep ravines and gulches. It was also almost entirely bare of snow. The ice in the straits was still moving and was hummocky, making it unfit for sledge-traveling. The ice-foot bordering on the straits, often used for travel, did not afford Hall the means of extending his journey. It was in some places entirely worn away; in others it was covered with hummocks. Before starting on his walk Hall had made some careful measurements of the altitude of Jupiter when near the meridian, from which the latitude of this sixth and last encampment was ascertained to be 82° 00′ 30″ N. **1871. October.**

On the 20th, it was his intention to start on his return to the Polaris, but he was induced to remain, by the Esquimaux who predicted a violent storm. These predictions were strengthened by the falling barometer, the lowering sky, and the "storm-roar upon the mountains."

At 8 a. m., he started out for a walk, and made further examinations into the formation of the long ridges of hillocks of shingle that fringed the beach. He was soon compelled to retrace his steps, for at 9.30, the storm broke upon him in all its fury. The bay in which the party were compelled to remain storm-bound in their snow-house has a general direction from northwest to southeast,

1871. October. extends for about forty miles into the interior, and varies in width from three to eight miles. Captain Hall named it "Newman's Bay," after the Rev. J. P. Newman, D. D., of Washington, D. C. The cape at the base of which the camp was located was called "Cape Brevoort," after Mr. J. Carson Brevoort, of Brooklyn, N. Y., "a strong personal and Arctic friend." The cape at the southern entrance received the name of "Sumner Headland," as a slight token of Hall's appreciation of the effective support received from the distinguished Senator.

The following is copied from the notes made by Hall in the evening of this day:

"This has been as dull a day with us as one might expect. Joe took his rifle a little past meridian and went out to the N. E. to hunt for musk-cattle. He bundled up as well as he could that he might be well protected against the storm. At the same time Hans, with his gun, went to the open water to try and shoot some seals. Both hunters returned at 3 p. m. Joe saw no game, while Hans saw three seals and made a shot at one but did not kill it. As for myself, I have been out now and then looking around seeking specimens of plants, and trying, as I have often done before, to find something of a coal character. I am deeply anxious to find coal in this country, as this mineral would contribute largely to our success in getting the Polaris to a far higher latitude

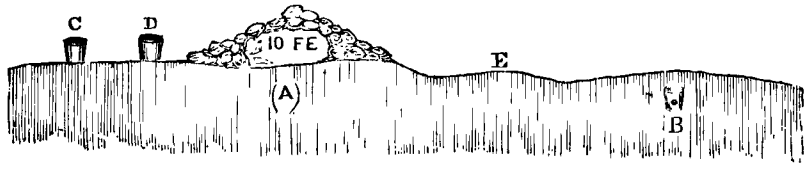
"next season. Wherever one goes here he finds specimens of stones that look like coal, but on close trial it proves to be slate-stone. This p. m., with my snow-knife, in a few minutes, I dug my large seal-skin mittens full of a small plant that is quite abundant here and about Polaris Bay; a plant not exactly 'Andromeda tetragona,' but perhaps of that family. I brought what I had gathered to the encampment to make a trial of it as fuel, but, from the fact that it was all full of frost, it could not be coaxed to burn. I think if this plant were gathered in the fall and dried it would make fuel. Any way, if our sealers are successful in the spring and summer of next year (1872), the oil of the seals can be turned to excellent account by saturating the plant I have just alluded to in the oil, and thus a capital combination-fuel for steam-generating on the Polaris will be formed. While gathering these plants I found the full stand-droppings of a musk-ox. They are like those of the reindeer, except the balls are larger—the size of bullets 16 to a pound. Generally the traces of musk-cattle are in mass—like balls all melted together. I gathered a handful of them and brought them to the snow-hut. I found that on crushing one it was completely dry, and that it expanded to almost double its original size. It struck me it would make capital wicking for Esquimaux lamps. I saturated the crushed mass with melted tallow, and I found, as I expected, the substance made excellent

1871. October.

1871. **October.** "wicking. Mr. Chester has been busy first at one kind of work and then of another—anything to keep himself occupied. He has voluntarily taken upon himself the work of cook for myself and party, which extra work he does most cheerfully and exceedingly well."

Hall, having written a dispatch to the Hon. Secretary of the Navy and carefully deposited it on the land, thus describes the place of its deposit:

"9.40 a. m., complete the cairn and deposit the document. The monument, two feet high and two and one-half feet at its base, is on the brow of the second plain from the sea, about fifty feet above its level.



"B. Buried cylinder.

"C. Condensed-milk canister filled with sand.

"D. Two-pound meat-can.

"E. Small water-trench.

"A. Cairn.

"10 F. E. This stone of slate placed at A. in the "ground, face up, close to the one above, which is vertical.

"Fog and indistinct light.	Cape Brevoort (N. 50° E.)? Sixth encampment, distant 43 of my measures. (N. 15°

"Chester, at my suggestion, took one of the boards of the twenty-eight pound wooden box, that I ordered to be taken apart last evening, (a couple pounds of which we used last night in making scouse,* and six quarts of extra water) and with his knife cut in bold letters 10 F. E. (feet east), and this and thirteen other pieces of that box were scattered about the cairn. It was not without difficulty that we found stones of sufficient size and number with which to build this small pillar. Joe dug the hollow in which to deposit the copper cylinder. This cylinder was one of those specially designed for deposits, and was rendered air and water tight by being sealed with white bees-wax; at the bottom I placed a small piece of board, then on either side two other pieces; and, last, on the top, another; then we covered the same over with three inches of shingle of the plain." **1871. October.**

The following is the dispatch:

"SIXTH SNOW-HOUSE ENCAMPMENT,

"CAPE BREVOORT,

"NORTH SIDE ENTRANCE TO NEWMAN'S BAY,

"(Latitude 82° 3′ north, longitude 61° 20′ W.,)

"*October* 20, 1871.

"*To the Honorable Secretary of the United States Navy,*

"GEORGE M. ROBESON:

"Myself and party, consisting of Mr. Chester, first

* Lob-scouse or olio.

1871. October. "mate, my Esquimaux Joe, and Greenland Esquimaux Hans, left the ship in winter quarters, Thank-God Harbor, latitude 81° 38′ north, longitude 61° 44′ west, at meridian of October 10th, on a journey by two sledges, drawn by fourteen dogs, to discover, if possible, a feasible route inland for my sledge-journey next spring to reach the North Pole, purposing to adopt such a route, if found, better than a route over the old floes and hummocks of the strait which I have denominated Robeson's Strait, after the honorable Secretary of the United States Navy.

"We arrived on the evening of October 17, having discovered a lake and a river on our way; the latter, our route, a most serpentine one, which led us on to this bay fifteen minutes (miles) distant from here southward and eastward. From the top of an iceberg, near the mouth of said river, we could see that this bay, which I have named after Rev. Dr. Newman, extended to the high land eastward and southward of that position about fifteen miles, making the extent of Newman's Bay, from its headland or cape, full thirty miles.

"The south cape is a high, bold, and noble headland. I have named it Sumner Headland, after Hon. Charles Sumner, the orator and United States Senator; and the north cape Brevoort Cape, after J. Carson Brevoort, a strong friend to Arctic discoveries.

"On arriving here we found the mouth of Newman's

"Bay open water, having numerous seals in it, bobbing up their heads, this open water making close both to Sumner Headland and Cape Brevoort, and the ice of Robeson's Strait on the move, thus debarring all possible chance of extending our journey on the ice up the strait. **1871. October.**

"The mountainous land (none other about here) will not admit of our journeying farther north; and as the time of our expected absence was understood to be for two weeks, we commence our return to-morrow morning. To-day we are storm-bound to this, our sixth encampment.

"From Cape Brevoort we can see land extending on the west side of the strait to the north 22° west, and distant about seventy miles, thus making land we discover as far as latitude 83° 5′ north.

"There is appearance of land farther north, and extending more easterly than what I have just noted, but a peculiar dark nimbus cloud hangs over what seems may be land prevents my making a full determination.

"August 30th, the Polaris made her greatest northing, latitude 82° 29′ north; but after several attempts to get her farther north she became beset, when we were drifted down to about latitude 81° 30′. When an opening occurred we steamed out of the pack and made harbor September 3d, where the Polaris is. [Corner of manuscript here burned off.] Up to the time I and my party

1871. October. "left the ship all have been well, and continue with high hopes of accomplishing our great mission.

"We find this a much warmer country than we expected. From Cape Alexander the mountains on either side of the Kennedy Channel and Robeson's Strait we found entirely bare of snow and ice, with the exception of a glacier that we saw covering, about latitude 80° 30′, east side the strait, and extending east-northeast direction as far as can be seen from the mountains by Polaris Bay.

"We have found that the country abounds with life, and seals, game, geese, ducks, musk-cattle, rabbits, wolves, foxes, bears, partridges, lemmings, &c. Our sealers have shot two seals in the open water while at this encampment. Our long Arctic night commenced October 13th, having seen only the upper limb of the sun above the glacier at meridian October 12th.

"This dispatch to the Secretary of the Navy I finished this moment, 8.23 p. m., having written it in ink in our snow-hut, the thermometer outside minus 7°. Yesterday all day the thermometer minus 20° to 23°; that is, 20° minus to 23° minus Fahrenheit.

"Copy of dispatch placed in pillar, Brevoort Cape, October 21, 1871."

Leaving the sixth encampment early on the morning of the 21st, the party retraced their steps, and early in the afternoon arrived at the point on the southern shore of

the bay where their fifth encampment had stood. It being very cloudy, and the little daylight rapidly passing away, it was determined to remain at that point over night. The old snow-house was repaired, and in a short time they were comfortably established in it. The next morning Hall has the following record: **1871. October.**

"Notes before leaving seventh encampment, which is the same as the fifth. Our morning repast finished at 6 a. m.; each of us had a quart pot of smoking-hot chocolate, with condensed milk in it. This with sea-bread, two kinds, made of white and Graham flour, raw pemmican, and raw clear pork, makes a most excellent and nutritious breakfast. It is my purpose to strike direct for the head of this bay, and, from some prominent mountain there, try to see the character of the country north, to determine whether sledging in that direction would be feasible; also to look for a route homeward and hunt musk-cattle.

"Every morning now, the first thing that I wish to learn is, whether the stars, or rather Jupiter, can be seen; but generally the heavens are in gloom. Latitude by observation is what I desire, though the elements for determining the latitude of Cape Brevoort I have from post-meridian observations of Jupiter the other morning. We start up the bay, and soon, leaving the new ice, come upon century-old ice, that, commencing from one side of the bay, spreads over to the other. At 10 a. m. I place

1871. October. "my tripod on the top of a century-old ridge of hummocks, and take compass-sights to all the prominent points about. At 11, having regained the new ice, stop to examine what appears to be an old floe along which we have been sledging for ten minutes. It is five feet above the new ice upon which we are, and which also extends under it. The upper surface has hillocks, and looks very old. It appears to be fixed. Hans says it is all the same as a glacier. A little after noon we leave the ice of the bay, and travel up a gulley upon land. At 2.30 p. m., stop to make the eighth encampment. At 5.10, the snow-house was ready for occupancy."

The weather had been overcast and foggy; very disagreeable, as Hall says, for Arctic night-travelers. "We have now actually not more than nine hours daylight in which to travel, and do outside work, as loading and unloading sledges, and making snow-houses. From 7 to 8 in the morning, and from 4 to 5 in the evening, it is quite dusky, nevertheless we manage to do many of our outside duties without much trouble. To-night, though overcast and cloudy, I read off the time from my watch by daylight at 4.37. To-morrow we shall go in for a musk-ox hunt."

On the 23d, circum-meridian observations of Jupiter were made, which gave 81° 39′ as the latitude of the eighth encampment.

"Our snow-house is a fair representative of the others; is 9 feet in diameter, 5½ feet high from the floor to the dome, and 4 feet from the bed to the dome. The whole spiral, including keystone or key-snow, consists of forty-eight blocks of snow 6 inches thick, about 1 foot wide, and from 2 to 3 feet long. The day, like most all the others during this sledge-journey, has been so foggy as to make it quite impossible to take such sights as I have desired to take, and also to render useless any time that I might spend in trying to hunt musk-cattle. It is now my purpose to make for the Polaris, which we shall most likely reach to-morrow. The ninth encampment was made near the Inland Island, and also quite near, within two rifle-shots, of the second encampment. I have omitted to note that our sleeping-bags, our vestments, everything that we have to wear, are all saturated with the moisture, and frozen stiff. We have not the necessary fuel by which to dry the same. We have, to a certain extent, adopted the plan of taking our smaller articles, such as mittens and stockings, to bed with us. By placing them inside our sleeping-bags, and next to our bodies, they become partially dry by morning. When we unpack our sleeping-gear, our sleeping-bags have to be coaxed a long time before we can unroll them; they are so stiffly frozen. But these kinds of difficulties we do not mind much. So long as we can forward the service we

1871. **October.**

1871.
October.

"are engaged in, so long will we laugh at such obstacles as those mentioned."

On the 24th, the snow having been hardened by an eastern gale, they were able to make good progress, and a little past noon Hall writes:

"My deep anxieties are relieved, for I and Joe could not till this moment sight the masts of the Polaris."

VII.

CHAPTER VII.

1871. October.

Upon Captain Hall's arrival at the Polaris, he went on board, and was assisted by Mr. Morton in getting off his fur clothing. He spoke very encouragingly of the prospects of the expedition, and added that he expected in a couple of days to start upon another sledge-journey which would complete the fall work. He had not been in the cabin more than a half-hour when John Herron, the steward, brought him a cup of coffee. He drank it, and was immediately taken very sick. He vomited a good deal, retching violently. He went at once to bed. Dr. Bessels, who was at the observatory, was summoned, and after examination expressed grave fears that the sickness might be fatal. At 8 p. m., he announced that Captain Hall's left side was paralyzed, and that he had had an apoplectic attack.

On the 25th, Captain Hall felt much better, although he had suffered very much during the night. He was able to eat some chicken and arrowroot. In the evening

1871. **October.** he again became very sick, and was in great pain from his constant efforts to vomit. After having passed another very uncomfortable night, the morning of the 26th found him again much better. The fever which accompanied the attack had left him, and with the exception of being very weak, he seemed quite well. During the day, Dr. Bessels administered quinine to him and applied cold compresses. On the 27th, Captain Hall was worse, and his condition was critical. Dr. Bessels said that if, in his present state, he had another attack, the result would be fatal.

In the evening, the doctor proposed to bleed him, but Hall resolutely objected. On the 28th, he was very much worse, and symptoms of mental aberration began to appear. He no longer recognized those about him. He refused to take medicine.

On the 29th, his condition was generally the same, except that he showed marked evidences of insanity. Every effort was made to keep him quiet and free from excitement. Divine service was held in the forecastle.

On the 30th, Hall remained in the same condition as on the two preceding days. He refused all medical aid and all nourishment, under the impression that an attempt might be made to poison him.

On the 31st, having enjoyed a good night's rest, he felt much better. He talked rationally, except that he still entertained his former apprehension, to which he

steadily adhered. The refusal of all medicine seemed to be beneficial, and he improved rapidly, and on the 1st and 2d, appeared to be well, though weak. He took a little nourishment, but the same suspicions still haunted him when he seemed otherwise to be perfectly sane. He would take no food from any one but Hannah, whom he worried with many anxious inquiries regarding it. On the 3d, Captain Hall talked as if in the full possession of his faculties. **1871. November.**

On the 4th, after much persuasion, he submitted to the doctor's treatment, who prescribed a mustard bath on this and the next day. He ate a large quantity of cooked seal-meat, contrary to the doctor's directions.

On the 6th, he looked and felt well, and strong hopes were entertained of his recovery. Notwithstanding the injunction of Dr. Bessels, he got up and dressed, remaining up nearly all day. He was to all appearances perfectly sane, and employed his time in getting in order the records of his sledge-journey. He dictated for several hours to Mauch, and began to interest himself in the ordinary duties of the ship. That night, however, he had another attack and became alarmingly ill. Early on the morning of the 7th, he sank into a comatose state, breathing heavily, during which his body was rubbed with mustard. In this condition he remained until 3.25 a. m. of the 8th, when he expired.

1871. November. The ship's company was awakened. and the sad intelligence conveyed to them. There was but one expression—of deep, heartfelt sorrow. The crew was exceedingly depressed. They had learned to love and appreciate their leader, and to repose full confidence in him. He had treated them with kindness and consideration, and in return they loved and trusted him.

The Esquimaux, Joe and his wife, were almost heartbroken. They had looked upon Hall as a father, for nearly ten years. They never could hope to find any one who would take his place. They had been with him in many trials and dangers; they had often saved his life; they felt alone in the world.

The officers who had messed with him, known him more intimately, and appreciated his singleness of purpose and force of character, knew that the life of the expedition was gone. His zeal and forethought had animated and directed the smallest duties. Hall inspired enthusiasm. He furnished the incentives which influenced even the most zealous and which stimulated the efforts of the most indifferent.

He was at the same time the leader and the hero of the expedition.

Captain Hall had a good constitution, and in general was rarely sick. He had been, however, at times suddenly and violently attacked. Those who knew him well

and were much with him in former years were aware of these attacks, which he recorded in his journals. His disposition did not incline him to enter much into details concerning his own sufferings. He never complained except when illness delayed the progress of his work. 1871. November.

While on his second expedition, on the 25th of March, 1865, he speaks of the suffering arising from the strained position he is obliged to take in writing up his journal, and adds that it occasioned quite sharp and severe pain in his left breast. And again, on the 15th of May, he mentions the pains in the left breast, which he says had increased, and had caused the raising of blood. On the 1st of December, 1868, he is suddenly taken sick at night from an unknown cause.

On the 5th of June, 1869, he writes: "I have felt unequal to the task of making notes; in fact, I had thought, just before leaving the 41st encampment, that my very life was fast ebbing, so severe and sudden an attack did I have of pains in the stomach; but by the prompt action of my men, at my orders, to unload the already prepared sled for our starting on our journey and get me my bottle of the essence of peppermint, I feel that I was saved. A large dose of the restorative, timely exhibited, soon dispelled the gloom that was universal around me. Thanks to Him who overrules all, that I still live. I have not yet fully recovered from my prostrate state. but

1871. November. am in a fair way for it. That time I shall not soon forget. As noted, we were all ready to start—resuming our journey—the women, in fact, had gone on ahead; though far from well, yet I had no idea but I was quite able to go right on, when I suddenly felt an indescribably ill turn coming on. I told my men my fears, and gave in brief words what I wanted done, and, for some time after, all seems to me as a dream indistinctly remembered. It is distinct in memory that I found myself on a single hairy deer-skin within the roofless circle—the snow-wall of our before-deserted igloo—and surrounded by my attentive men and the natives, all deeply anxious to do whatever they could for me, each wearing an anxious, sympathizing look, as I lay there recovering from the shock just experienced. I was soon on my legs again, but too prostrate to think of doing any more than ride. I never experienced such an attack before, and pray I may never again."

These are interesting as records, generally, of sudden attacks, not unlike the one of which Hall died. He was also the victim of short but violent attacks of sickness during his laborious efforts to organize his third expedition.

Colonel Lupton, with whom he was intimate while in Washington on this business, relates that when these efforts were relaxed by the favorable action of Congress

on his appropriation for the Polaris expedition, the reaction led to such a total prostration of his vital energies that he was enjoined to go to the sea-shore. 1871. November.

Hall was a large man, and possessed a phlegmatic temperament, which must have been severely taxed by his great excitement, especially while in Washington endeavoring to carry into execution the idea which had for many years held dominion over his desires and faculties. So thoroughly had he identified himself with his work, that his feelings in regard to it began to assume the form of a religious enthusiasm. A natural consequence of this excitement was an absolute prostration of the system when the goal was reached. On retiring to quiet and private life, he partially regained his strength, although he continued busily employed on his plans. He was soon recalled into active life by the necessity of superintending the outfit of the vessel. He was so constituted that he could not delegate to others his authority and responsibilities. Painfully conscious of the importance of the position he held, and of his obligations to the President, from whom he had received his appointment, he spared no exertions in doing the work with which he had been intrusted.

For several weeks just previous to sailing he was under medical treatment.

We learn from a letter written by Mr. Joseph Cox,

1871. November. Presiding Judge of the Court of Common Pleas, Cincinnati, in which city Captain Hall enjoyed a short visit to his family before he sailed, that while in company with the Judge, "going up Vine street, near Sixth, he complained of suffering from vertigo; said it troubled him frequently, and added that the only thing which gave him relief was eating one or two pounds of raw beef-steak; and bade me" (the Judge) "good-bye, saying that he must go to a butcher's shop and get some now to relieve him, so that he might recruit and be ready to return to New York."

This was said on the last day which Hall spent at his western home; and said to one with whom he had been for years on terms of intimacy, and to whom he had just freely communicated his plans and his strong confidence of success.

Captain Hall's restless activity did not cease when he got to sea, and it may be said that it never ceased up to the last day of his good health.

During his last illness, one or two persons were always near him; every night some one sat up with him; Mr. Chester and Mr. Morton watched with him more frequently than any others. Hall placed great confidence in them, especially in Morton. At one time, however, in his delirium, he suspected even Morton's fidelity, and refused to take any nutriment from the hands of any one except Hannah.

1871. November.

Although, when out of his mind, he spoke roughly to Dr. Bessels, in his sane moments he fully appreciated the doctor's care and kindness. Just before he died, while Dr. Bessels was smoothing his pillow, Captain Hall said, "Thank you, doctor; you have been very kind to me." Speaking these words, he turned over and fell into his final sleep.

The apprehension of personal injury manifested by Hall, during his last illness, may be regarded as the return of a mental condition excited at times during his previous long residence among the Esquimaux. Then these apprehensions were more or less well founded. Duing his solitary seclusion there was undoubtedly occasional cause for personal mistrust, and whenever such a cause arose, his solitude and helplessness may very naturally have exaggerated his fears. Hall's friends have never spoken of him as a suspicious person; but nothing is more natural than that he should have been upon his guard among those rude people.

In his journals may be found several exemplifications of this state of mind, instances of supposed slights and injuries, and of his even entertaining fears for his personal safety. These cases have been carefully noted and examined, with special reference to his state of mind in his last sickness. He was undoubtedly in a condition of mental aberration when he exhibited these fears; but

1871. November. their real origin may be traced to a habit of mind acquired during his lonely life among the Esquimaux.

It is not impossible that his incoherency in one instance may have proceeded from his recalling a scene of violence occurring in one of his former expeditions, in which he had been obliged to act with promptness and vigor. Its result had, however, always constituted a painful recollection.

An inquiry into the circumstances attending the death of Captain Hall was made after the return of the officers and crew of the Polaris. The result of this inquiry is given in the following certificate:

"WASHINGTON, D. C.,
December 26, 1873.

"SIR: We, the undersigned, were present, by request of the honorable Secretary of the Navy, at the examination of Dr. Emil Bessels in regard to the cruise of the Polaris and the circumstances connected with the illness and death of Captain Hall. We listened to his testimony with great care and put to him such questions as we deemed necessary.

"From the circumstances and symptoms detailed by him, and comparing them with the medical testimony of all the witnesses, we are conclusively of the opinion that Captain Hall died from natural causes—viz., apoplexy—

Funeral of Captain C. F. Hall, Nov. 10, 1871.

"and that the treatment of the case by Dr. Bessels was the best practicable under the circumstances. 1871. November.

"Respectfully, your obedient servants,

"J. K. BARNES,

"*Surgeon-General United States Army.*

"J. BEALE,

"*Surgeon-General United States Navy.*

"Hon. GEORGE M. ROBESON,

"*Secretary of the Navy.*"

The body of Captain Hall, after having been prepared for burial, was covered with the national flag.

A party sent on shore to dig a grave, found the ground frozen so hard that it cost the greatest labor to make any impression. After the most fatiguing efforts with various tools on this and the following day, they succeeded in excavating to the depth of twenty-six inches—the seat of permanent frost—which was considered sufficient to protect the coffin from the bear, the only disturber to be feared. This work, in consequence of the obscurity of the day, was excuted by the light of lanterns.

After the body was placed in the coffin, in the cabin, all hands were called in to look, for the last time, upon the face of him who had been their commander. They gazed upon it with the most affectionate tenderness and regard. A sense of loneliness and loss filled their minds, and the

1871. November. future, which, under the inspiration of Hall's enthusiasm, had been so promising, was now dark. Little was said as the sorrowful procession passed the open coffin and viewed the lifeless remains. When this was over the coffin was closed and carried to the after-deck.

At 11 a. m. of November 10, 1871, the ship's bell was tolled, the coffin was placed on a sled, and the procession which had been formed on the ice, moved toward the shore. Although near the middle of the day, it was quite dark. The sky was overcast and gloomy, and they were compelled to pick their way over the ice by the light of lanterns. Captain Tyson headed the procession. The officers and the Esquimaux walked beside the sled, or followed it slowly. In crossing the ice that lay between the ship and the shore, the hummocks were avoided and a smooth track was followed between the icebergs and the smaller masses. Striking the shore near the observatory and ascending the little hill, they moved down the plain to the grave. The ground was in general covered with snow, but many places had been kept bare by the wind.

The coffin was placed in the grave, and Mr. Bryan read a short burial-service. The silence which followed was broken by the sound of the earth upon the coffin and by the sobs of Hannah.

Nature seemed to be in harmony with the event. The temperature, although a few degrees above zero, was

exceedingly uncomfortable, owing to the prevalence of a strong breeze from the northeast. A snow-drift accompanied this high wind; surrounding objects were indistinct; the face of the earth was in the last degree bleak and desolate. **1871. November.**

After the grave was filled, the little company slowly separated to return to the ship, meditating on the momentous questions touching their own present and future, which were forced upon them by this overwhelming calamity.

VIII.

CHAPTER VIII.

The death of Captain Hall proved to be fatal to the main object of the expedition—to the fulfillment of that purpose for which he had qualified himself by many years of banishment from home—the attainment of the Pole, if possible, or the absolute proof of its inaccessibility. 1850.

The world is already acquainted with the details of his residence among the Esquimaux during the years 1860, 1861, and 1862. The immediate object of that first residence was the search for the remains of Sir John Franklin's expedition. To this he was stimulated by the fitting out of the first Grinnell expedition; and at this time, indeed, was laid the foundation of that zeal for Arctic exploration which guided and controlled the whole remainder of his life. While carrying on the business of an engraver in Cincinnati, as early as 1850, he devoted all his leisure hours to the study of Arctic exploration, being indebted for the means of study to the liberality of the Mercantile Library Association of that city. At this

1854. time he was under great obligations to his friend, Col. James Lupton, President of the Association, who, anticipating his future usefulness and fame, liberally supplied him with works of Arctic literature. From this date he maintained the deepest interest in the successive expeditions for Franklin's relief, including those of England and our own country.

On the return of Dr. Rae, in 1854, with some of the relics of Franklin's expedition, the British Government refusing to make further search, Hall seriously entertained the idea of co-operating with McClintock, who commanded Lady Franklin's vessel, the Fox. He took some steps toward obtaining for this purpose the British ship Resolute, abandoned by Parry, rescued by Capt. James Budington, of Connecticut, and restored at the national expense to England. But before this idea could be carried out, McClintock returned with his interesting information. Hall was, however, well satisfied that the subject had been by no means exhausted, and he entered on fresh efforts to accomplish an object which had now taken entire possession of his mind.

Without entering into details already published in the Introduction to his "Arctic Researches," it may be said here that he finally collected the means of making his first expedition, an account of which is given in that work. It is grateful to read the story of his own exertions, and

of the liberality of his friends, among whom he particularly mentions Mr. Henry Grinnell, Mr. Miles Greenwood, and Mr. R. M. Bishop, of New York. Through their help he was enabled to procure the outfit of a boat, sledges, provisions, instruments, &c., necessary to his undertaking; all of which Messrs. Williams and Haven, of New London, Conn., offered to convey free of charge to Northumberland Inlet in their bark, George Henry, giving him also free passage. Hall left New London on the 20th of June, 1860, and, after touching at Holsteinborg, Greenland, reached Cyrus Field's Bay, on the opposite coast, August 18, where the ship went into winter quarters. 1860.

Since he had been unable to carry out his original design of having a schooner at command, his plan of operations was to start early in the spring in his boat with a native crew, reach the head of Northumberland Inlet, and, crossing a narrow portage, to follow the outlet of a lake to Fox's Channel, and passing thence through Fury and Hecla Straits, go as far as Victoria Harbor. Once there, a sledge-journey would enable him thoroughly to explore all the region about King William's Land, and obtain satisfactory information respecting the fate of Franklin's men. This plan could not be carried out in consequence of his losing his boat by a storm in the month of September following. But during his two

1862. years' residence in that region he made several boat and sledge journeys, acquired a familiarity with the mode and conditions of Arctic travel, and enlarged the boundaries of Arctic geography.

In a letter written several years afterward to the Senate Committee on Foreign Relations, when applying for aid from the Government, he says of this first expedition: "From my own determinations, by astronomical observations and surveys, I succeeded in adding to our charts about fifteen hundred (1,500) miles of coast-line."

When Hall reached St. John's, Newfoundland, on his return, September 23d, 1862, he sent a telegram to Mr. Henry Grinnell and Mr. Cyrus W. Field, saying: "I am bound for the States, to renew voyage, have not prosecuted my mission to the extent proposed on account of loss of craft; but thank God he has empowered me to do something; have solved the mysteries of near three centuries relative to Sir Martin Frobisher's expeditions under the auspices of Queen Elizabeth; have learned the fate of the five men captured from Frobisher by the Esquimaux; identified the exact places of his landings, especially the Countess of Warwick's Sound, where Frobisher attempted to plant a colony of one hundred men; recovered therefrom, and have them on board, a large number of relics of said expeditions; have explored over one thousand miles of coast, including the so-called Frobisher's Straits, which I have

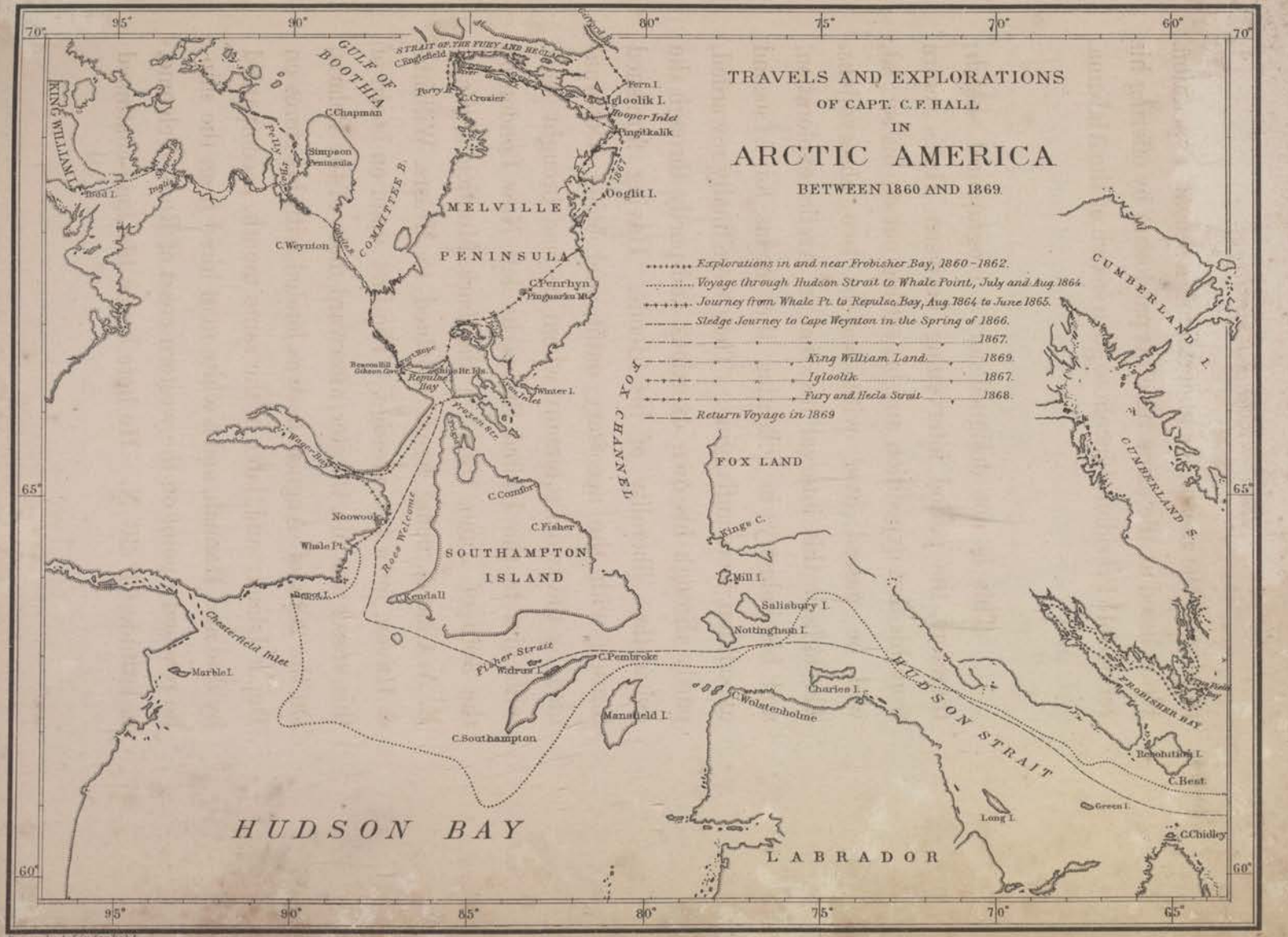
discovered to be a bay terminating in latitude 63° 48′ north, longitude 70° west; have also discovered a great glacier and a mountain of fossils between Hudson's Strait and Frobisher's Bay." 1862.

Of the relics referred to in this telegraphic dispatch, a part were transmitted to the British people through the Royal Geographical Society of London, and a portion were sent to Prof. Joseph Henry, to be deposited in the Smithsonian Institution, Washington. A full list of those deposited with the Royal Geographical Society will be found in the "Three Voyages of Martin Frobisher," edited by Rear-Admiral Collinson, C. B., for the Hakluyt Society. A number of those belonging to the Smithsonian Institution, together with interesting remains of Parry's, Franklin's, Rae's, and McClintock's expeditions, form part of the Arctic collection exhibited by the United States Naval Observatory at the International Exhibition of 1876 in Philadelphia.

During his residence among the Esquimaux he adopted their manners and customs, conforming entirely to their mode of living. Here he acquired his early training for Arctic explorations. It was on this expedition that he first met Joe and Hannah, thereafter his fast friends and constant companions. It is a proof of his unabated interest in the subject that on his return home he immediately commenced his lecturing tours, by which he hoped

1864. to acquire the means for undertaking a second expedition. He evinced at the same time his patriotism by offering his services to President Lincoln to go in search of the Alabama.

This is not designed for a biographical sketch; therefore, the period intervening between Hall's return from his first expedition and his setting out on his second, will be passed over with one or two observations. Throughout this interval his zeal in Arctic exploration, and his industry in collecting the means for a second expedition, were unflagging. They were finally rewarded, partly through his own exertions and partly through the exhaustless liberality of his friends. Having furnished himself with the necessary outfit, and being accompanied by the two Esquimaux whom he had brought back with him to the United States, he left New London on the 30th of June, 1864, in the bark, Monticello, Capt. E. A. Chapel, being again indebted to Messrs. Williams & Haven, for a free passage. The first mate on board of this vessel was Mr. Chester, afterward mate of the Polaris. On the 20th of August, he was landed with his stores on Depot Island; and, later in the same month, accompanied by Joe and Hannah, and a white man hired from the ship, he reached a point on the western coast of Roe's Welcome, in latitude 64° 36′ N. He here began his long-continued



Drawn by J. Lindenkohl.

Esquimaux life, taking up his abode in their igloos, and conforming his habits in all respects to theirs; assimilating himself to them and learning their traditions. He heard from them that Franklin and his men had an encounter with one of the Indian tribes; that afterward all of the former starved, except Captain Crozier and three of his people, who passed one winter with the very natives with whom Hall was then living; that when the white men were first seen, "Crozier was very thin but his three companions were very fat;" that Crozier started with them south for the purpose of reaching one of the settlements of the Hudson's Bay Company; and that with one of the men he actually visited the Esquimaux of Chesterfield Inlet. **1865.**

In the following summer Hall resumed his journeys. In the early part of June, after experiencing much difficulty and danger, he arrived at the northeast side of Repulse Bay, in latitude 66° 13′; by September he had moved on to Fort Hope, Rae's former headquarters, in the neighborhood of which, latitude 66° 32′, longitude 86° 56′ W., the party went into igloos for the winter. Hall here used for a store-house an oven erected by Rae in 1845.

On the 31st of March, 1866, he started on his sledge-journey with the Esquimaux, toward King William's Land. Traveling was difficult and slow over the chain of lakes

1866. lying between Gibson's Cove and the "Sea of Akkoolee," as the Esquimaux call Committee Bay. At the end of one month, on reaching their highest point, in latitude 68° N., about six miles above Cape Weynton, he met with some natives who had in their possession silver spoons given them by Crozier and stamped "F. R. M. C." Here, however, the natives who were with him, being frightened by the accounts received, from the Esquimaux of the place, of hostile tribes beyond, refused to proceed further; he was forced to return to Repulse Bay, "disappointed," as he says in his journal, "but not discouraged." In the mean time he discovered other very positive relics of Franklin's men. He spent the summer in surveying the coasts of Repulse Bay, and in gathering further knowledge of the lost explorers. He and his party subsisted by hunting and salmon-fishing. At one time they succeeded in killing a whale, which was afterward a source of some profit to him from the sale of its bone. Several whalers passed the winter in the bay, and held frequent intercourse with him.

To prepare himself for a second effort to reach King William's Land, in March, 1867, he made a sledge-journey to Igloolik, where, by means of presents, he secured a number of dogs. He spent a month in surveying the region around Parry's winter-quarters; he also made a valuable survey of Ship's Harbor Islands. During his

winter-residence of 1867–68, near Beacon Hill, at the head of Gibson's Cove, Hall became confident that some of Franklin's men still survived on the shores of Fury and Hecla Straits, and determined to rescue them before going to King William's Land. On the 23d of March, 1868, in company with Joe, Hannah, and one white man, he ascended, by nearly his former route, as far as Ooglet Islands, passed up Hooper Inlet, and, going up the western branch of Crozier River, discovered a long, narrow lake, which he named "Grinnell Lake," and its outlet "Brevoort River." Following this outlet to a large bay he turned to the southward and found, near Cape Crozier, the monument of which the natives had told him as having been built by white men; but the deep snow prevented his search for records. Hall carefully surveyed the coast up to the entrance of Fury and Hecla Straits—a part of the American Continent which had never been explored; he then visited Gifford River, finding there also relics of white men, and returned to his quarters June 26th. 1868.

At this time occurred the mutiny among the five white men whom he had hired from the whaling-ships the preceding autumn. It began with threats of desertion and ended with Captain Hall's shooting the leader. The circumstances attending this event belong to his biography; they are minutely detailed in his journal. Notwith-

1869. standing the refusal of the white men to renew their term of service with him Hall remained to carry out his purpose of reaching King William's Land. Spending the rest of the season in laying in supplies for the following year, and in making a survey around Lyons Inlet, which corrected Parry's chart and placed a new inlet on the maps, Hall passed his fifth severe season with the Esquimaux at Repulse Bay. There were as many as one hundred and twenty-two Esquimaux living there; yet food was plentiful, and he seems to have been quite happy in his celebration, among them, of the New Year's day of 1869.

After many preparations, Hall at length, on the 23d of March, again started for King William's Land. His company consisted of five Esquimaux men, three women, and two children.

Following the route he had traversed twice before, he reached his *cache* near Cape Weynton April 2d, and found it undisturbed; some of the provisions had been damaged by exposure.

Entering the land at Colvile Bay, he traveled in a northwesterly direction, and on the 9th reached the ice of Pelly Bay. The natives whom he here met showed him many articles which had belonged to Franklin's expedition.

Continuing his journey, he made an almost direct

westerly course over the land, and, crossing Simpson and Grinnell Lakes, he reached the ice of Inglis Bay on the 28th of April, having fortunately killed some musk-cattle and deer on the way. 1869.

Crossing Sheppard's Bay, he approached King William's Land, and, when near that island, found many other relics, and heard much more respecting Crozier and his men, from the Innuits. They said that one of Franklin's ships, after having been abandoned, drifted down to the shores of O'Reilly's Island, and was there visited by several of the natives.

The Innuits were convinced that some white men had passed a winter in the ship there. Afterward, the natives had obtained a great deal of wood from the wreck, and, breaking into the cabin, found there a very large man—dead. The ship was subsequently so broken by the ice that she sank.

From his conversation with the Innuits, Hall became satisfied that he had discovered the places where the remains of at least seventy-nine of Franklin's men lay. On the 8th of May, he started with a small party to visit Todd's Island and the shores of King William's Land. Here, also, with many other relics, he found human bones in several places.

One entire skeleton he brought home. It was afterward placed by Mr. Brevoort, of Brooklyn, in the hands

1869. of an English officer. Hall erected monuments over the places where the dead men lay, and fired salutes in honor of their memories.

At Sheppard's Bay he met other natives, who had seen Crozier and his party of about forty-five men in July, 1848, a few miles above Cape Herschel. They had given Crozier some meat. Crozier's men were putting up a tent in which to pass the night, and the natives encamped near them; but while Crozier's men were sleeping the natives got up and went away. The party seemed very hungry. Nothing more was seen of them until the following spring, when the natives found their dead bodies. Captain Crozier's body was never found, and they believed that he had escaped and reached his country. Captain Hall blamed the Innuits for not remaining and hunting for the Crozier party.

The Esquimaux who were with Hall now insisted that the land would soon be bare of snow, and that unless they began their return they would not be able to get back to Repulse Bay until fall. Captain Hall, though very anxious to remain longer about King William's Land, was compelled to yield to their wishes. On his return, he followed substantially the same route as that taken on his outward journey. Stopping frequently to hunt, they killed eighteen reindeer, seventy-nine musk-cattle, and two seals. In speaking of this, Hall remarks that Crozier

and his party need not have starved if they had known the resources of the country, or had with them a few Esquimaux to point out its abundance. 1869.

The month of July, was spent in further surveying, in hunting and fishing, and in preparing to return to his country. Hall had determined to attempt a journey to York factory if no whaler appeared by the 10th of August, but on the 6th of that month he received a visit from Captain Fisher, of the Ansel Gibbs, who had just arrived in the bay. On the 26th of August, he placed on board, the whalebone which he had secured, and eighteen deer, which latter were fully appreciated by the ship's company. With Joe, Hannah, and a little girl whom these Esquimaux had adopted, they arrived at New Bedford on the 26th of September, being presented with a free passage by the owner of the vessel, Mr. Jonathan Bourns, junior.

Some time after his return, Captain Hall addressed to Judge Charles P. Daly, president of the American Geographical Society, a letter in which he gave a concise account of the geographical results of this his second expedition. In justice to Hall, this compendious statement of the work of five years is here given.

"DEAR SIR: Continued occupation since my return has prevented me from giving you, as you requested, an account, in detail, of what I have observed in respect to

"the geography of the Arctic regions. With my first voyage you are sufficiently familiar, and I have nothing to add to what is contained in the volume published by the Harpers. During the last five years that I have spent in the Arctic, I availed myself of every opportunity afforded me for accurate observation, and I give you the results. You will remember that Wager Bay is an old discovery of Middleton's, in 1742, when he was in search of a north-west passage. The general outline or rough sketch then made remains unimproved to the present day. I explored this inlet for sixty miles, up and down, to its junction with Roe's Welcome, and made a series of observations from astronomically-determined positions.

"Repulse Bay, though visited by Middleton, and afterward by Parry and by Rae, still remains but imperfectly defined. I have, from my own observations, the data for a more accurate delineation of the outline of this bay. I discovered and surveyed a new inlet in latitude 67° north, longitude 84° 30′, a few miles north of Norman's Creek, of which it may be said to be a counterpart, running from Lyon's Inlet to the eastward. I may be excused for expressing to you the gratification I felt in making this discovery, remembering that Parry, in 1821, when exploring and surveying the opening to which he gave the name of Lyon's Inlet, determined, as he says in his narrative, to leave no opening or arm unvisited; and yet with all his

"care and the aid of his officers and four boats' crews, he overlooked the new inlet I found, from the fact that a high island shut out from his view the entrance to it. I discovered a bay on the west side of Fox Channel, latitude 69°, longitude 81° 30′, which makes west-southwest for fifteen miles. This Parry also missed, which is not remarkable when we consider that his was a marine survey along the west side of Fox Channel to Ig-loo-lik, an island near the eastern end of Fury and Hecla Strait. I discovered an important lake, twenty-five miles in length, in latitude 68° 45′ north, longitude 82° west. I call it important, as it abounds in salmon of large size, some being six feet in length. It contains, also, many other species of fish, some of which I think have been hitherto unknown. Also another lake, latitude 69° 35′, running parallel with Fury and Hecla Strait, about fifty miles in length. It has two outlets. I followed up Crozier's River, the mouth of which Parry discovered, and found its source to be the lake described. At the west end of the lake is another outlet forming a river, which I followed down to the Gulf of Boothia, where the river discharges itself into a fine bay—another discovery. It fell to my lot, also, to ascertain the northwestern part of Melville peninsula, at and below the western outlets of Fury and Hecla Strait, which may be said to complete the discovery of the American continent.

"I discovered a long island lying to the northwest, and westward of the western outlet of Fury and Hecla Strait, and also the coast of the mainland on the north side of the above-mentioned outlet of the strait, and I found that the "Jesse Isle," laid down and so named on Dr. Rae's chart, at the north of Parry Bay, latitude 69° 30′, longitude 85° 10′, is not there.

"Although Parry had his vessels, the Fury and the Hecla, near to Amherst Island, in 1822, and sent out from there exploring and surveying parties, directing them to search, if possible, for the western outlet of Fury and Hecla Strait, they were unable to find it. In the following spring, 1823, while his vessels were in harbor at Ig-loo-lik Island, latitude 69° 21′, longitude 82° west, Lyon, Parry's associate, undertook to reach the western outlet of the strait by means of sledges and dogs; but after journeying for nineteen days he failed to accomplish it. In 1847, Dr. Rae left his headquarters at Fort Hope, at the head of Repulse Bay, with the intention of reaching the outlet of Fury and Hecla Strait, but before he could get there his provisions gave out, and he was compelled to turn back. I had some reason, therefore, to feel gratified when I found myself traversing the very region that such intrepid explorers as Parry, Lyon, and Rae had attempted to reach in vain.

"The next important contribution to geography was

"my discovering an important island north of Ormond's Island, at the east end of Fury and Hecla Strait. What Parry has put down upon his chart as the mainland, north of Ormond's Island, is an island, but somewhat less in size than Ormond's Island.

"I think that if Parry had known of the existence of the channel which is on the north side of the new island that I refer to, he would have succeeded in getting his vessels much farther to the westward in the strait than he did. By passing through this new channel and by keeping close to the land on the north side of the strait, Fury and Hecla Strait, like the passage leading into Wager Bay, and like Hudson Strait in the navigable season, may be penetrated by keeping on the north side, while the opposite or south side is encumbered by heavy ice.

"From intelligent Esquimaux, whom I met at Ig-loolik, I obtained information about, and sketches of, the west coast of Fox's Farthest, latitude 66° 50′ north, up to what Parry calls "Murray Maxwell's Inlet," which is near the east end of Fury and Hecla Strait. Murray Maxwell's Inlet, as Parry calls it, is in reality a sound or strait that sweeps around to the eastward, forming a large island. If you take your pencil and continue the so-called Murray Maxwell's Inlet to the eastward and to the blank in Parry's chart, you will have the delineation of the island that is there. To the eastward of the Calthorpe Isles and Cape

"Konig, you will find the broken lines of the land that Parry discovered. He could not determine whether it consisted of islands or formed a part of the mainland. From Esquimaux, who had been there, I learned that it consisted of two islands. The nearest approach I made to them was on my visit to Fern Island, which you will find on Parry's chart attached to the narrative of his second voyage.

"At Ig-loo-lik I met Esquimaux who were natives of Cumberland Sound, sometimes called Cumberland Inlet, which, you know, is on the west side of Davis Strait, above Frobisher Bay. These natives made their way to Ig-loo-lik by first making a portage from Cumberland Sound to a large lake, called upon the charts Kennedy's Lake, and which, by the way, I may remark, no white man has ever yet seen, and then launching their oo-mi-ens (women's boats) upon the lake, which they traversed westward, entering a large river, and drifting down it with a swift current to Fox's Farthest, where the river enters the sea. From there they turned north, and coasted along up to the Cathorpe Isles, and from there crossed over to Ig-loo-lik.

"From Esquimaux at Ig-loo-lik I also obtained important information of a new bay that will not only be of interest to geographers, but must, I think, eventually be of great value to our commerce. The entrance to this

"bay has only been seen, and is indicated upon the Arctic charts as Admiralty Inlet. Nothing has been known, however, by civilized man of the extent of this bay or of its character. The entrance is from Barrow's Strait, latitude 73° 43′ north, longitude 83° west, and the bay extends very nearly in a southern direction to about 71° north latitude. The west side has a coast-line on a gradual curve from Barrow's Strait to near its limit, the concave on the east, while the west (east?) side has many bays or fiords, with some good harbors in them. The bay is free from ice every summer, and none of the ice from Barrow's Strait ever finds its way into it. This bay abounds in whales (*Balæna Mysticetus*, or smooth back, the most important to civilized man), in narwhals (the sea unicorn), and in seals. So abundant are the whales, that the natives sometimes kill in their rude way as many as five large ones in a few days. The information I derived from the Esquimaux has convinced me that this new bay will prove as valuable to whalers as Cumberland Sound. From 1840 to the present time the product from whale-bone and oil from Cumberland Sound, by English and American whalers, has amounted to $15,000,000; and as the area of the whale-fishery is gradually diminishing, the fact of the existence of this bay I regard as of great value, as opening up a new ground for the prosecution of this important industry.

"I also obtained valuable information from the Esquimaux at Ig-loo-lik respecting Pond's Bay, the western prolongation of which, upon our present Arctic charts, is miscalled Eclipse Sound. If the testimony of the Esquimaux can be relied upon, and I place the fullest confidence in it, Pond's Bay terminates in longitude 81° west (approximately); and the representation upon the Arctic charts of a strait from Pond's Bay to Prince Regent's Inlet, on the northern part of the Gulf of Boothia, is erroneous.

"It has been the supposition of geographers that Davis Strait and Baffin's Bay are connected with Fox's Channel by straits. This is not the fact. All the intelligent Esquimaux that I have met in my two voyages assert that the land bounded on the north by Barrow's Strait, upon the east by Baffin's Bay and Davis Strait, on the south by Hudson's Strait, and on the west by Fox's Channel and Prince Regent's Inlet, is one land or *one great island.* They know of a much smaller island, that has Pond's Bay on its south side, Navy Board Inlet (or, more properly, strait) on its west, Lancaster Sound on its north, and Baffin's Sea on its east side.

"My other contributions to geography are that Dr. Rae's Colvile Bay, in latitude 68° north, longitude 88° 20′, is not a bay, but very low land; that his Grinnell Lake and Simpson Lake, which he delineates as one continuous

lake, are, in fact, three distinct lakes; and, lastly, that his Shephard's Bay extends northerly about twelve miles beyond the limit he has assigned to it.

"This, my dear sir, embraces all I have to communicate. You will remember that I went out with very limited resources, and was more circumscribed for the want of means than almost any Arctic explorer. Should I again go out, as I trust to do, I hope to extend the area of geographical discovery and accomplish something that may redound to the credit of our common country.

"Very respectfully, yours,

"C. F. HALL.

"Hon. CHARLES P. DALY,

"*President American Geographical Society.*"

The purpose of giving the preceding summary of Hall's Arctic explorations, previous to his taking command of the Polaris Expedition, has been to show how eminently he was qualified for that service, not only by his zeal and devotion to it, but by a long course of discipline, and by the hardihood, and knowledge, acquired by living nearly eight years in the region of the Esquimaux, as no white man had ever done before.

One of his objects in going there was to acquire knowledge and experience to be employed in a future exploration of the highest attainable latitudes of the

Arctic Ocean. His settled conviction was that there was a way open to the Pole itself.

When he took command of the Polaris he held in his hands the very means, long coveted, of gratifying his paramount wish to carry out this idea.

The vessel was thoroughly built and amply supplied with stores and provisions. The officers and crew were particularly well trained for Arctic service. Several of the officers were men of uncommon ability and of large experience.

To commence with the scientific corps:

Dr. Emil Bessels, the head of this corps, as is well known, was a graduate of the University of Heidelberg, a man devoted to science, and eminently sagacious and industrious; in addition to this he possessed the advantage of experience. Under the auspices of the celebrated geographer, Dr. Petermann, of Gotha, he had gone out in the sealing-vessel, the Albert, in 1869, and made extensive explorations in the seas between Nova Zembla and East Greenland, with important observations on the Gulf Stream. He had served for six months as volunteer surgeon in the Prussian army in the Franco-German war. He had volunteered to accompany the expedition as soon as he heard that there was difficulty in obtaining the services of a competent person.

Mr. R. W. D. Bryan, a graduate of Lafayette Col-

lege, Pennsylvania, was recommended by his Alma Mater for the position of Astronomer. Previously to sailing he prepared himself for his duties by an additional course of study and practice at Washington. He seems to have enjoyed in an eminent degree the confidence and esteem of all his associates.

Mr. Frederick Meyer, a native of Prussia, graduated at a military academy, and received a commission as lieutenant in the Prussian army. Before he left Germany he held an appointment in Maximilian's army, but on reaching the United States decided not to go to Mexico. Having entered the United States Army, he was detailed as a signal observer at Saint Louis. He distinguished himself in his corps by the accuracy of his observations, and the systematic and thorough performance of his duties, and was detailed by General Albert J. Myer, Chief Signal-Officer United States Army, to serve on board the Polaris.

Of the officers of the ship under Captain Hall, Capt. S. O. Budington had made thirteen voyages to Baffin's Bay, and had commanded several whale-ships, in one of which, in 1860, he carried Captain Hall to Frobisher's Bay.

Capt. G. E. Tyson, the assistant navigator, had had command of five ships in the whaling service. In the years 1865 and 1867 he had met Captain Hall at

Repulse Bay, and he was with Capt. James Budington when the Resolute was found and brought to the United States.

Mr. H. C. Chester had spent ten years whaling in Arctic seas, principally in Behring Straits. He was a man of great strength and activity, and of marked force of character. He was devoted to his profession. His personal influence over the crew proceeded from his officer-like conduct, as much as from his other qualifications as a seaman.

William Morton had passed nearly thirty years of his life in the naval service, part of which was during the late war. He had been with De Haven in the first Grinnell expedition (1850–51), and with Kane in the second (1853–55). Dr. Kane said of Morton that he was as gallant and trustworthy a man as ever shared the fortunes or claimed the gratitude of a commander. Morton transferred to Hall the allegiance he had formerly given to Kane.

Mr. E. Schumann, the engineer, had been assistant engineer in the service of the Lloyds Steamship Company, having been a long time on board the Saxonia. He was an excellent engineer and machinist. The manner in which he saved the Polaris from destruction (described in the body of this narrative), proved that he possessed great coolness and excellent judgment. When he joined

the Polaris, he could scarcely speak a word of English; before he returned to the United States he not only spoke the language well and fluently, but enjoyed reading the works of Dickens.

His assistant, Mr. Odell, had been in the service of the Government during the late civil war. He was a practical man, a good machinist and blacksmith.

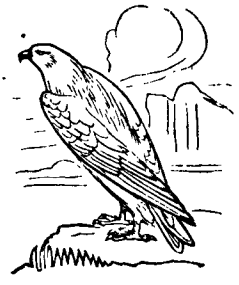
Mr. J. B. Mauch, in addition to his ordinary duties, showed himself possessed of culture and ability as an observer of natural phenomena. His observations are frequently cited in this narrative. The ingenuity and skill of the carpenter, Mr. Coffin, were exercised with fidelity whenever his health permitted him to be on duty.

The sterling qualities of the crew of the Polaris have been more than once noted in the text, on the authority of their experienced mate, Mr. Chester. These were abundantly tested in the trials and the dangers which attended the termination of the voyage.

Concerning Joe, Hannah, and Hans, it is sufficient to recall their valuable services as interpreters and as hunters, who often maintained the very lives of the ship's company.

The object of this enumeration and of these comments is to show that Hall possessed every means, instrument, and qualification for attaining the end of his voyage; except, indeed, personal good health. If he had carried

with him in the Polaris the strength and power of endurance exhibited in his former explorations, he might have reached his utmost hope, that of raising the flag of his country over the Pole.



IX

CHAPTER IX.

The crew, during the two weeks of Hall's illness, had been employed in their ordinary daily duties, such as cleaning decks, keeping the fire-hole open, procuring ice, and other like work; and in addition, nearly every day they were engaged in banking up the sides of the ship with snow. At first, the blocks of snow were cut from the bank near the observatory, and sledded over to the vessel. A few windy days, however, brought the snow in thick drifts off from the land, and packed it against the prominences which rose near the ship, above the general surface of the ice, so that the labor was not so great. Owing to the rapidly decreasing daylight the work was greatly delayed, and was not completed until the 7th. A wall had been by that time built all about the vessel from 5 to 8 feet thick, and as high as the top of the bulwarks where the awning was housed. A flight of large snow steps was made, leading to the opening in the awning, which was on the port side, just over the forward gangway.

1871. November.

1871. November. During a part of this time, the temperature had been very low, and when the wind blew, exposure was very trying. The men, however, stood it bravely, and received the commendations of their officers. Although skins had been provided for clothing, none had as yet been made up; the men had nothing to wear except their ordinary clothing: yet such care was taken that not a single frost-bite occurred.

Messrs. Bryan and Meyer, assisted by two of the seamen, banked up the observatory, and made a covered, winding approach to it to keep out the wind. On the 2d, Joe and Hans, under the direction of Mr. Bryan, built two snow houses for magnetic purposes. It was originally intended to use the observatory for such observations; accordingly, as has been previously mentioned, it was built with copper nails and bolts. The house, however, proved to be too small for any addition to its original service. The two igloos, or snow huts, were built not far from the observatory, and were connected by an arched passage-way; another passage led to the covered area in front of the observatory-door. In this way one could go from the observatory to either of the igloos without exposing himself to the wind. One of the snow houses was designed for the dip-circle and the other for the declinometer.

On the 4th, Mr. Meyer began to make regular

hourly meteorological observations. A small shelter had been built against the eastern side of the observatory. In it were placed the standard thermometer, the wet and dry bulb psychrometers, the maximum and minimum thermometers, and the ozonometer. The first three were read every hour; the last three once in every twenty-four hours. An anemometer was fastened on an upright post, frozen into a barrel to keep it firm. Solar and dry radiation thermometers were also used. Inside the observatory, the barometer and an electrometer, connected with prepared points fastened to a pole raised near the building, completed the outfit of the meteorologist. Mr. Meyer readily obtained the assistance of Dr. Bessels, who could not work upon his special branches until the spring. They divided the day into three watches of eight hours each, and took them by turns, so that one of them was at the observatory sixteen hours out of the twenty-four. The carpenter built a pier for the transit-instrument, which Mr. Bryan prepared to use on the first favorable opportunity. The tidal observations were made by two of the seamen, Robert Kruger and Hermann Siemens, during the day from 6 a. m. to 9 p. m.; and by the anchor-watch during the remaining nine hours. **1871. November.**

On the 28th of October, Hans set some seal-traps, without success; the two natives frequently went hunting, but were generally unsuccessful. On the 4th of Novem-

1871. November. ber they found a large extent of young ice, only three inches in thickness. Passing cautiously over they heard a peculiar noise, and soon the head of a huge bearded seal was thrust up through the ice. Hans at once fired at it, but did not kill it, and the animal disappeared. They waited patiently for it to re-appear, but in vain. The next day, however, they had better success. About 4 p. m., Hans came to the vessel, making the joyful announcement that he had succeeded in killing a very large seal, and wanted help to bring it to the ship. The men started at once to bring back the animal, which proved indeed to be a very large one—*Phoca barbata.* It is called by the Greenland Esquimaux "Ursuk;" in North Greenland, "Oo-sook;" and by the Esquimaux on the west side of Davis Straits, "Ook-gook." It was so heavy that the men found no easy task in dragging it to the vessel. Its weight was estimated at 1,500 pounds, and its thick coat of blubber was thought by experienced whalers to contain a barrel of oil. The meat was highly prized and carefully stored away, to be used during the winter in case any of the company should be attacked by the scurvy. The skin of this seal is greatly prized by the natives, being used by them as sole-leather, and, when properly prepared, answering this purpose excellently well. They also use it to make their seal, walrus and other lines, such as dog-traces, sled-lashings, &c. When

the skin of this animal cannot be procured, they use other hides; but this is preferred, being stronger, lighter, and more readily worked than that of the other seals or of the walrus. 1871. November.

At times it was feared that there would be the same difficulty in keeping the dogs as was experienced by both Kane and Hayes; but the peculiar malady described by those explorers did not break out. Up to the 3d, however, from one cause or another, thirteen dogs had been lost—six large ones and seven puppies. There still remained fifty-four—six Newfoundland and forty-eight Esquimaux dogs. The puppies died rapidly, without any apparent cause. They had generally been fed every other day, or, at times, twice a week. At first they were fed on the dried fish bought for that purpose at the Danish settlements, and sometimes with the old seal-meat procured at the same time. Besides this, the puppies were fed with bread. Hermann Siemens had no doubt that the poor dogs were starved, for he thus feelingly writes: "My heart would almost break when I saw the poor creatures thus starved. He who caused this will have to answer for it at the last day. He who delights in the sufferings of a beast will grow cold and heartless and surely also torment his fellow-men; he never can love God."

Captain Hall's regulations in regard to fuel were rig-

1871. November. idly observed. Mr. Noah Hayes continued to weigh out all the coal that was consumed, and during the month of October the weekly average in all the stoves was 1,184 pounds. The whole amount consumed during the month was distributed among the different stoves as follows:

	Pounds.
Berth-deck	1,271
Cabin	1,354
Galley	1,769
Observatory	344
Total	4,738

The daylight had been growing steadily less. On the 28th of October, stars of the first magnitude could be seen at noon, while on the 1st of November, it is recorded that stars of the second magnitude could be seen all day. What was called "daylight" existed for about four hours, from 10 a. m. to 2 p. m., during which time the twilight was strong enough to enable the men to see to work outside in banking up the vessel.

On the 6th, the thickness of the ice was measured. Near the vessel it was 2 feet 2½ inches thick; 50 feet from the vessel toward the shore, 2 feet 9 inches; and 25 feet further on, 2 feet 11 inches.

The weather during the sickness of Captain Hall had been very fine, being unusually calm and clear. The

thermometers varied from a few degrees below zero to —25°. During the 6th and 7th, however, the temperature became milder, the thermometer going up to 14° above zero. This was accompanied by a warm breeze from the southwest and a light snow-storm. **1871. November.**

CHAPTER X.

1871. November.

On the death of Captain Hall, the command of the expedition devolved upon Captain Budington, who began at once to exercise its duties; no change was made in the ordinary routine.

On the 13th, Dr. Bessels prepared the following paper, which he submitted to Captain Budington. It was signed, as will be seen, by both gentlemen.

"*Consultation.*

"THANK-GOD HARBOR,

"*November* 13, 1871.

"First consultation held between Messrs. S. O. Budington and E. Bessels. Through the mournful death of our noble commander, we feel compelled to put into effect the orders given us by the Department, viz:

"'Mr. Budington shall, in case of your death or disability, continue as the sailing and ice master, and control and direct the movements of the vessel; and Dr. Bessels

1871. November. shall, in such case, continue as the chief of the scientific department, directing all sledge-journeys and scientific operations. In the possible contingency of their non-concurrence as to the course to be pursued, then Mr. Budington shall assume the sole charge and command, and return with the expedition to the United States with all possible dispatch.'

"It is our honest intention to honor our dear flag, and to hoist her on the most northern part of the earth, to complete the enterprise upon which the eyes of the whole civilized world are raised, and to do all in our power to reach our proposed goal.

"S. O. BUDINGTON.
"EMIL BESSELS."

About this time, the ship's company were startled by a loud cry of distress, at midnight, from the room of the carpenter. He was found covered by his blankets and crouching in horror in a corner of his bunk, believing that he had heard a voice calling to him from the adjacent store-room, which was closed and locked. He supposed that some one had a design upon his life. To pacify him the store-room was carefully searched; but notwithstanding the proof thus afforded of his having been deceived, he continued in the belief that he really had been threatened.

This was the first indication of what afterward proved to be an occasional mental aberration. It was thought to be owing to the exposed situation of his room, which had already affected his health in other respects. Captain Budington, soon after, gave him the berth in the cabin which had been occupied by Captain Hall. 1871. November.

Hayes, on the 11th, fell down from the gangway-ladder, wrenching one of his knees very badly. He suffered with it for a week, but regained its use, and was soon able to resume his duties.

In consequence of some apparent irregularities in the tidal observations on the 12th, Robert Kruger and Hermann Siemens, two very trustworthy men, were placed in exclusive charge of them, after which the observations did not exhibit the former discrepancies; frequent soundings were taken to make sure of the zero of the scale.

The wind varied, of course, in direction and intensity, but generally fresh breezes or heavy gales prevailed from the N. E. with large snow-drifts and declining temperature. The snow drifted into strange shapes and piles about the vessel.

On the 12th, after the very severe drift of the night previous, a gangway was cut from the ship to the tidal apparatus, with banks on either side five feet high. The gales from the N. E. were very severe, rising to a velocity

1871. November. of 47 miles per hour. When strong gales from the north prevailed, the ice in the straits was driven to the southward, leaving many open spaces. On the 13th, a low water-cloud hanging over these open spaces hid the opposite shore from view. During calms or very light winds, an incoming tide would bring the ice up again, and very little water could be seen; a similar result was produced by a southerly wind.

On the 14th, lime-juice was given out for the first time. The men relished it, and it was made a regular article of daily use.

On the 15th, Mr. William Morton, the second mate, complained of a soreness in the heel. During his service with Kane on the second Grinnell expedition, 1853–55, he had one of his heels badly frozen, losing some of the bone; the wound had never fully healed. When in temperate regions he was not troubled by it. The sore was an open one, and being in the center of the heel, he lost, for a time, the use of his foot.

On the same day at about 5 p. m., an aurora borealis was seen. It was a faint arch near the southern horizon extending in an east and west direction.

After the cooking-stove was moved into one of the state-rooms, the caboose was used as an ice-house, and the crew were employed in procuring ice from the berg.

The provisions specially brought for the dogs having

failed, they were now fed on pemmican, a can weighing forty-five pounds being given to them every three days. When they were to be fed the whole troop, forty in number, were let in through the door in the awning over the gangway upon the deck. The Esquimaux chopped up the pemmican and divided it so as to give each dog his portion. This was done in the port gangway. Two or three men were on hand to assist and control the dogs. When the food was ready, one dog at a time was allowed to go into the passage and remain there until he had eaten his portion; when he had finished he was put out on the ice again. It was always an exciting time. The utmost vigilance was required to keep the dogs in order and prevent them after being fed from rejoining the others and getting a second share. At times their attack upon the door of the gangway was so violent that it was almost impossible to keep them back. Two men generally guarded the door, armed with clubs, which they were compelled to use lustily upon the wild and savage brutes. It was exciting sport for the men, and although hard and dangerous work they generally enjoyed it. 1871. November.

On the 16th, an elaborate proclamation was prepared, setting apart, according to American custom, the last Thursday of the month as a day of thanksgiving. It was posted in prominent places about the vessel, and excited much amusement by calling forth innumerable jokes.

1871. November. The seal, which was much admired, was designed and made by Mr. Schumann.

The 16th, being a clear day, a bright arch of yellowish light was seen over the southern horizon for about two or three hours before and after meridian. When, however, it was cloudy, no tinge of daylight was discernible.

On the 17th and 18th, a fresh breeze from S. S. W. moderated the severity of the temperature, raising the thermometer above zero. On the 18th, the crew took advantage of the warm weather to enjoy themselves upon the ice. A large team of dogs was harnessed to one of the sleds, the Newfoundland dogs being principally used, in order to train them for spring work.

Divine service had been held on the 12th and 19th. At the conclusion of the service on the latter day, Captain Budington announced that the daily morning prayers would in the future be discontinued, but that the regular Sunday services would remain as heretofore. He assigned as a reason for this order that during the winter Mr. Bryan would be engaged in his duties at the observatory, and would not be able to be present.

The gale from the northeast, which began on the evening of the 18th, increased in violence during the 19th, until it had acquired the velocity of 47 miles per hour. It continued with that force all through the night of the 19th, and on the 20th it had not abated.

1871. November.

At 4 a. m. of the 20th, Hermann Siemens, a very strong man, going out upon the ice to make his usual tidal observations, was literally taken up by the storm and thrown upon the ice, which was covered with water. When he recovered from the shock, he found that he was on his back with hands and feet in the air; fortunately he still retained his lantern, which had not been extinguished. Getting upon his feet, it was only with the greatest difficulty that he was able to force his way against the wind and reach the fire-hole, and when there, the snow-drift was so severe that it was difficult to open his eyes long enough to read the scale of the tidal apparatus. The wind blew with such force against the broadside of the vessel that she was thrown over on one side, and the snow wall built around her was shoved out and broken. The open water could be seen within half a mile.

The galley-stove could not be made to work. The wind drove the smoke down the stack and filled the state-room and alley-way, so that no one could remain in the stifling atmosphere. The small stoves in the lower cabin and the forecastle were used, and each mess prepared its own breakfast.

Dr. Bessels had been on watch at the observatory since midnight, and as he did not return when his watch ceased, it was feared that something might have happened to him, occasioned by the storm. At 9 a. m., Mr. Meyer

1871. November. determined to attempt to go to the observatory to bring the doctor on board. Deciding to suspend observations during the continuance of the storm, he bundled up well and started, and after a severe struggle with the wind reached the shore. The ascent of the little hill upon which the observatory stood proved no easy task; he was repeatedly driven back.

It was absolutely impossible for him to stand against the wind, and even when creeping up the hill on his hands and knees, he was driven back nearly twenty times, but by dint of the greatest exertion he at last reached the summit, and found the doctor waiting until the storm moderated. He had been without fire since 1 a. m. It was his intention to continue the observations until the storm permitted Mr. Meyer to come and relieve him. While Mr. Meyer was there, the wind blew more violently than ever. He made several determinations of the velocity, which, after it exceeded fifty-two miles per hour, he was unable to measure.

The current-meter was broken so that it could not be used. The anemometer's cups were whirling around at an amazing speed, but it was not possible to stand before the wind long enough to read the indications of the instrument. The temperature was more than 20° below zero; and the strong wind greatly increased the sensation of cold. In addition to this the snow was drifting. The

air was filled with cold, hard snow-flakes and the small icy crystals which make up the snow-drifts. These had been torn from the surface of the high land to the north, and were being borne along at a speed of nearly a mile a minute. To stand with unprotected face against these sharp and angular atoms driven with such force, was no easy task. 1871. November.

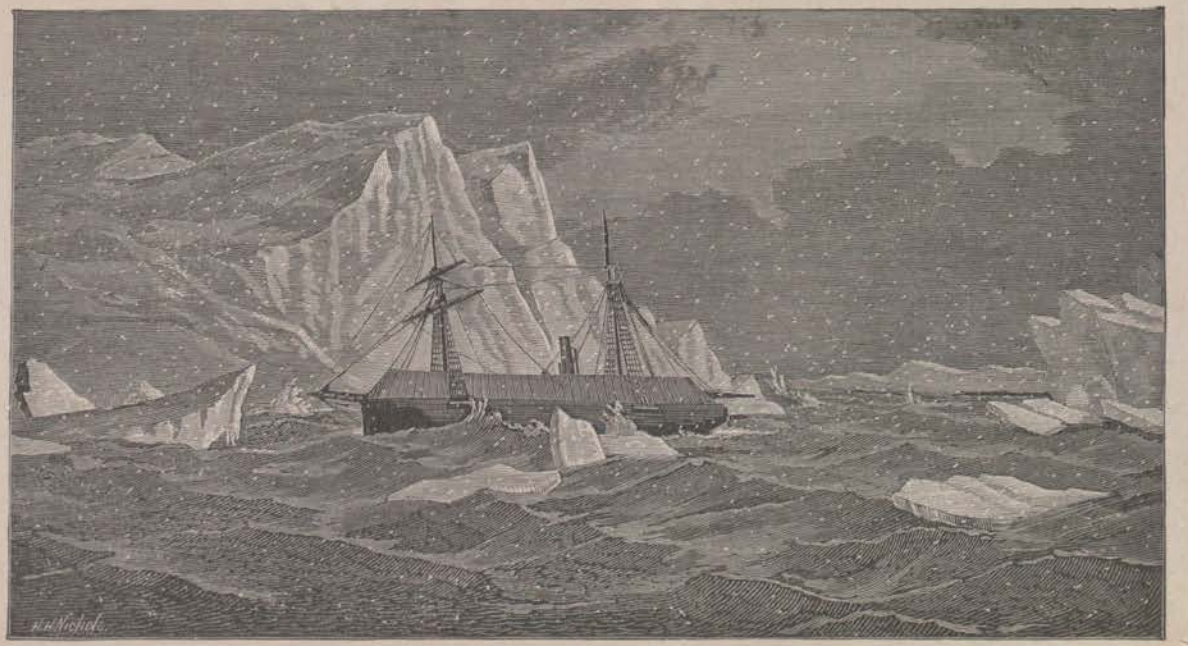
Mr. Meyer's progress was closely watched from the vessel, and great relief was felt when, at last, he was seen to enter the observatory. After, however, one-half hour elapsed without his re-appearing with the doctor, Captain Budington began to fear lest the doctor was in trouble. He accordingly sent the two Esquimaux to see that all was right, and, if so, to signal at once to relieve his anxiety. They had less difficulty than Mr. Meyer in accomplishing the distance, because they knew better how to battle with the strong wind. On arriving at the observatory they sent back the welcome signal, "All's well."

Soon the four men were seen coming over in pairs. As they reached the brow of the little hill the wind threw them down the declivity on which not even the Esquimaux were able to walk. They were hurried along by the wind over the level ice, and reached the vessel about 10.30 a. m., where they were warmly welcomed. They did not escape without some injury; all being frost-bitten with the exception of Hans. Dr. Bessels'

1871. November. ear was nipped. Mr. Meyer appeared with frozen eyelids and hands, while Joe's right cheek was whitened by the frost. Mr. Meyer was not as well protected as the others, and his frost-bites were much more severe; he felt great pain from them all day. Such was the severity of the storm that even the poor dogs suffered greatly. Their howls of distress so affected the men that the door was opened and they were all allowed to come on deck, where they were protected from the wind.

It was a day of anxiety. The creaking of the masts and the howling of the wind through the rigging proved that the storm still continued to rage. In the lower cabin the rocking of the vessel was felt, and so also the grinding in her icy cradle. The heavy canvas awnings covering the vessel made, when shaken by the wind, a sound like thunder. The gale lasted until 3 in the afternoon, when it began to moderate; at 9 p. m., it recommenced in all its force, although the barometer had risen; at midnight the wind blew, if possible, harder than before, and the barometer fell again.

At 1 a. m. of the 21st, the vessel began to feel the motion of the open water not far distant. The darkness was increased by the heavy drift of snow, so that nothing could be seen outside of the awnings. During the lulls of the storm the cracking of the ice around the vessel was distinguished. At 2.30 a. m., a severe shock



The Polaris Adrift, Nov. 21, 1871.

occurred, which startled everybody. It was soon discovered that the ship was afloat, and free from the ice. Her motion was so great as to render it difficult to read the barometer. The heavy snow wall which had been built close around the ship broke through the ice, leaving her surrounded by water. At 7 a. m., the two natives were sent to the observatory to obtain the current meter, and were told to see whether Providence Berg was still in its place; they soon returned with a favorable report; this was a great relief. **1871. November.**

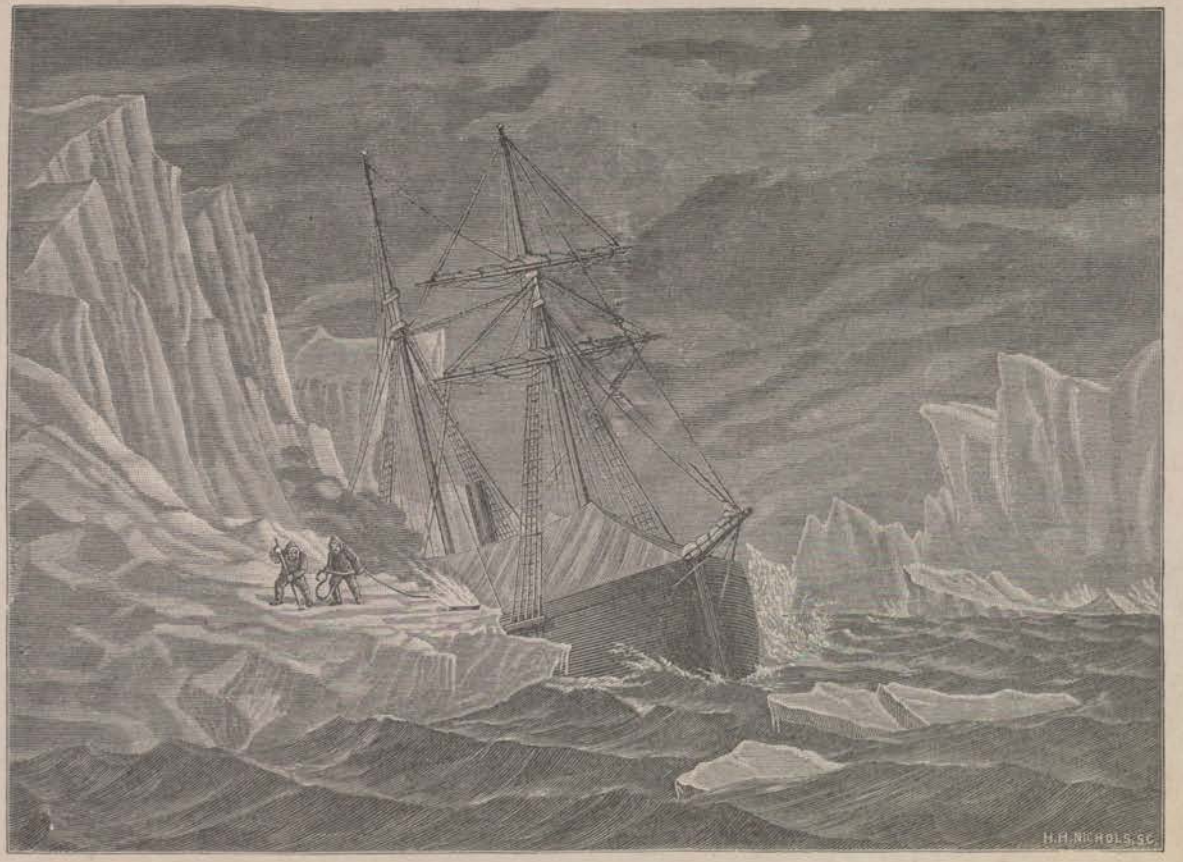
The vessel was repeatedly driven against the ice with severe shocks. Finally, at 8 a. m., the ice broke up and was carried away. Absolutely nothing could be seen at a distance of five paces. The ship being free, the chain, which had been left in the locker when the vessel was first frozen in, was bent, and the anchor got ready. Preparations were made to veer the other chain. The depth of water was found to be eight fathoms forward, and six aft. The hand at the drift-lead soon after reported eleven, twelve, and twelve and a half fathoms; the ship was adrift.

The order was immediately given to let go the starboard anchor, which was the best bower. After a little while she brought up. Not taking the chain, it was evident that she was not riding by her anchor; and upon further examination it was found that she had brought up

1871. November. against Providence Berg, which saved the vessel from being carried into the pack. The captain proceeded at once to get out his ice-anchors and to secure the ship to the berg. He hesitated about ordering men to this duty, made perilous by the darkness of the night, the extreme violence of the wind, and the steep and slippery surface of the berg.

William Nindemann first offered himself for the dangerous duty; immediately all the others stepped forward, not one holding back. Protected as well as he could be by skin clothing, Nindemann climbed out the forward port-hole on the starboard side, and reaching a projecting piece of the berg, began to ascend its side. The Esquimaux accompanied him. The side was so steep that he was compelled to cut steps in the ice with a hatchet. In order to light them at their work, a large pan containing tarred rope saturated with kerosene oil was set out on the ledge of the berg. When one anchor was firmly planted in the berg, and the vessel secured to it by a hawser, great relief was felt; to complete the security, two other anchors were made ready, and three seamen volunteered to assist in planting them.

All this occupied a long time, and it was not until 1 p. m., that the hands turned in. The captain decided to hold on to the berg, even if it should go adrift. Nindemann and one of the natives were frost-bitten during their exposure, but not seriously.



Fastening to Providence Berg, Nov. 21, 1871.

Outside the vessel the commotion still continued. 1871. November. The sound of the water dashing against the ship's side was threatening; the shocks of the vessel against the berg were alarming. Notwithstanding the heavy strain, however, the hawsers held famously. About 2 p. m., the gale moderated and the watch below were allowed to turn in.

Early the next morning, Hans, Kruger, and Nindemann went on shore to see the effect of the storm upon the observatory. They walked to the shore upon the ice still fast to the berg. The tidal apparatus was found uninjured, and Hans's sled was safe. Two sleds, one of which had been on board the relief-ship, under Captain Hartstene, were lost, besides several small articles left on the ice about the ship. Mr. Bryan, with Joe, went on shore to secure the magnetic instruments, which had been reported as exposed. The wind and drift had worn away the snow houses and filled them with snow. The declinometer was thrown from the stand, but all its parts were found except the carriage for the magnet. The observatory was standing, but completely buried; an entrance could be effected only by digging through a snow-bank six feet deep. Two dogs were missed, and at first it was supposed that they were lost, but upon its being suggested that they might have taken refuge in the dog-house on shore, the bank, covering the entrance was dug away and the dogs were found.

1871. November. It was a question whether to haul the ship back to her former place. She was, however, moved a short distance, so as to lie against the berg. The gale abated, but the sea continued, and prevented the water from freezing. The evening was clear and bright. The moon shone quietly upon a scene which the day before had been wild and threatening.

During the whole of the 23d, it was calm and clear, and a thin film of ice formed on the surface of the water.

On the 24th, the scientific observations, interrupted by the storm, were resumed. A supply of ice was obtained from the berg by sliding blocks down its side into the port-hole. The temperature of the external air was —23° Fahrenheit, while that within the canvas awnings was only —8°. The new ice about the vessel had acquired the thickness of five inches. The open water was about two miles from the vessel, but the west side of the straits appeared to be full of heavy pack, accumulated during the gale.

In the evening an aurora was visible. The forms assumed by it were peculiar, resembling in appearance and shape those called electric clouds. At times an arch was formed extending from horizon to horizon and passing nearly through the zenith. The arches were apparently narrow and the clouds thin and wanting in uniformity. The densest parts were the brightest.

The arches were completed by the addition of parts which at first appeared detached. They were formed in various ways. A band starting up from the horizon would receive a series of additions until it spanned the vault. Two bands rising from opposite points would extend, completing the arch. They disappeared in as many various ways as they were formed; but always as gradually as they came. The most attentive listener could not hear any sound. There was no marked disturbance of the magnetic needle either before, during, or after the phenomenon. The stars were seen through the clouds. The electroscope did not indicate any changes of electricity during their continuance. **1871. November.**

The vessel was exposed to the floes driven in from the straits, and the captain determined to bring her more under the protection of Providence Berg. The men were set to work on the 25th, sawing a dock in the young ice, already seven inches in thickness. The moon shone so brightly that it was convenient to work by her light alone. The vessel had drifted against the northeastern side of the berg, leaving her stern exposed to the attack of the floes. The dock being sawed, she was moved ahead eighty feet, and fifty feet from the berg, where it was hoped she would stay during the remainder of the winter, as she was lying under the protection of the berg and at a safe distance from it. The ship had run a narrow chance of

1871. November. being carried out into the channel, where she would have been exposed to serious injury, and would certainly have been carried south, in which case little or nothing could have been effected toward the objects of the expedition. The position was regarded for the moment as secure; but it will soon be seen how little this conclusion was justified.

On the 26th, Divine service was held in the lower cabin, which was more convenient because larger. The ice commotion in the straits still continued, the sounds of which were distinctly heard during the whole day.

On the morning of the 27th, the moon shone with such peculiar distinctness, and poured such a flood of light upon the scene, as to turn night into day. A well-defined halo of 22° radius encircled her disk, and during a part of the morning mock-moons also, were plainly visible. The one below, and those at each side of the moon, exhibited prismatic colors; they were very beautiful, but were soon effaced by the clouds.

Hans had not been idle since the young ice had been thick enough to bear him. He had set many seal-traps, and, visited them twice a day, but did not, however, succeed in catching any. Mauch, in his journal of this date, says that he accompanied Hans on his rounds, and after finding that no game was caught, proposed to go out into the straits and examine closely the formation of the hummocks. He could hear distinctly a noise resembling

the mutterings of thunder, produced by the ice in motion, and he proposed to go to the very spot where the noise originated. He reached the point after a brisk walk of half an hour, and there saw a large floe in motion, breaking its way through the young ice. It was moving quite rapidly, piling up the ice in every direction, sometimes in slabs as high as 20 feet, and making a great noise. 1871. November.

The spring-tide occurring on the 26th, increased the commotions of the ice near the vessel; water rose above its surface. This caused no uneasiness.

A light breeze from the south sprang up at 5 a. m. of the 28th. The temperature rose rapidly to six degrees below zero and, at the same time, the barometer fell. These changes indicated a gale from the southwest; at 11 a. m., it set in, forcing the pack toward the vessel. The young ice was broken in many places, and hummocks formed. Near the stern of the vessel the ice was cracked, and hummocks rose there also. The gale continued to increase in violence, until at 1 p. m. it had acquired the velocity of 42 miles an hour. When it first began, it was apparent that snow was falling heavily; but as the wind increased, it was impossible to tell whether it was fresh snow, or drift. The air was filled with flakes.

At 7 p. m., the storm increased in violence, and the ice began to pile up against the outer part of the berg.

1871. November. The noise was alarming, and the disturbance approached the vessel nearer than before. A visit to the top of the berg was made by Mauch at 9 p. m. Huge pieces of ice, moving under the pressure of the wind, were driven toward Providence Berg, and forced in, on either side, upon the shore. The immense pressure was at length too great for the berg; it was broken into two parts between which the ice was forced until they were separated by a distance of 8 feet. This event created some anxiety. The dogs were taken on board, and several preparations were made for the approaching crisis.

At 11 p. m., the berg was found to be in motion and the vessel immediately felt the pressure. One part of the berg being smaller, moved more rapidly than the other. In the interval before the berg reached the ship the strongest man held his breath, for it really seemed that she must be crushed in the same manner as the ice alongside. When it reached the vessel, she bore for a time its great pressure without yielding—but groaning under the immense strain. Several times it was thought that the ice had been forced through her side. Captain Budington remarked that the Polaris stood the pressure heroically, but that no vessel could possibly long hold together in her position. The wind at the time was blowing at the rate of 47 miles per hour, and the air was filled with drifting snow.

1871. November.

When the berg first came in contact with the ship, a large tongue of ice below the water was forced under the bows of the vessel, raising her somewhat, and with the help of the wind giving her a cant. This probably saved her. The result was that the ice between the ship and the shore broke, and the vessel began to move with the berg toward the shore, still laboring heavily.

The opinion of Siemens was undoubtedly correct: "Had the ice, lee-side of the berg, been equally strong as that on the weather side, the ship would surely have been cut through or thrown on her beam-ends." Even as it was, the vessel was greatly strained, and if she had not been exceedingly well built, the pressure would have been fatal.

The berg moved in toward the shore, shoving the little Polaris before it, until 2 a. m. of the 29th. At this time the tide turned, and as the berg would take the ground on the ebb the fear of a fatal accident was allayed. The people, worn out with labor and watching, were allowed to go below, leaving a sufficient number on deck. The engineer made a careful examination of the propeller, and found that it had suffered no injury.

At 3 a. m., the berg had firmly grounded. The falling tide was not, however, sufficient to overcome the momentum of the pack. It still continued to press upon the berg, and, not being able to push it forward, began

1871. November. to raise it up. A new danger appeared: the berg threatened to turn over and crush the ship. But at 5 a. m., the gale began to moderate, and the pressure upon the berg was so much diminished that it recovered its equilibrium.

Soon, however, other alarming circumstances appeared. As the tide fell, the stern of the vessel sank, leaving the bow 4 feet higher. At the same time she heeled over to port so much that it was almost impossible to walk the deck. The captain, who had been in his berth about two hours, was called. He saw that nothing was to be done, and after relieving their apprehensions sent the people again below. When the tide rose, the ship came to an even keel. During the gale, the temperature had risen considerably above zero, but when it ceased, the mercury again fell below.

The natives were very much frightened at the ship's position, and asked permission to go on shore, which was granted. To the surprise of Mr. Meyer who had remained on shore during the storm, they appeared at the door of the observatory. The women and children, with their loads of bedding and skins, crowded into the little room, persuaded that the vessel would be destroyed. Notwithstanding the odors which they brought with them, Mr. Meyer received them graciously, and gave them a share of his small establishment. In the afternoon the Esquimaux built two snow houses, meaning to live on shore.

1871. November.

The 30th was the day set apart by proclamation, as has been mentioned, as a day of thanksgiving. It was calm and clear. The ice was still, and the vessel lay quietly against the berg. Just having escaped from two great dangers the crew was prepared for a general thanksgiving. No work was done, and the whole day was given up to amusement. It had been the intention to have some sort of theatrical performance or minstrel entertainment, but the gale interfered with the preliminary practice, and it was given up. In the forenoon nuts of different kinds—hickory, hazel, walnut, pecan, and almonds—were distributed among the people.

Dinner, however, was the great event of the day. The steward and cook exerted their best skill and ingenuity in preparing the different courses. Considering the means at their command, they did extremely well, and the result of their labors was greatly relished. The fare was as follows: Oyster-soup, lobster, turkey, different kinds of meats, vegetables (the favorite being green pease), a very fine plum-duff, apple and cherry pie, North Pole cake, nuts, raisins, and wine-punch. Much time was spent at the table, and the dinner was greatly enjoyed. It was set in the lower cabin.

In the evening, coffee and chocolate were served. The men got up a little diversion, in which, as every one was inclined to be merry, all took part. Two of the

1871. November. men were placed in position and covered over so as to represent a donkey. Hans's little boy "Toby" was placed on the back of the animal and ridden about the vessel's deck. Peter Johnson was the manager, and controlled the movements of the beast with great skill. Noah Hayes headed the procession with his fiddle, to the sound of which the animal and its driver marched, followed by the other men. The after-guard were invited to watch the performances. Great amusement was afforded and many jokes were given and received. Some one remarked that there was a waste of material in the formation of the animal.

The quantity of coal used during November was 6,334 pounds, distributed as follows:

	Pounds.
Berth-deck	1,604
Cabin	1,516
Galley	2,186
Observatory	1,028

This increase of 1,596 pounds over the quantity consumed during October, is attributable not only to the lower temperatures during November, but also to the kind of coal that was used. It was decided that the soft bituminous coal purchased at St. John's, Newfoundland, could

be used with greater economy in the small stoves than in the furnaces. Hence, during November, the soft coal had been used exclusively, in order to save the anthracite for steaming purposes. **1871. November.**

XI

CHAPTER XI.

1871. December.

No very striking event broke the monotony of life on shipboard during the month of December. The vessel continued in the same position, leaning against the berg, with her bow perched upon its tongue. This situation was by no means desirable or comfortable. The ice about the stern had been piled up very high during the great pressure from the pack on the 28th of November, and it was impossible to effect any change of position. During high tide it made little difference, as the vessel was then nearly on an even keel; but at low tide the list was exceedingly disagreeable. Those who had bunks on the port side did not mind it much; but on the other side it was often a hard matter to keep in the berths. A new fire-hole was made on the 2d, and the tidal apparatus erected over it. The tidal observations were resumed, after a suspension of fourteen days. The seamen, when not employed about the ship, amused themselves in various ways.

1871. December. On the 2d, the weather being calm and the temperature not very low (about —7°), the men were engaged in out-door sports. Some were driving about the ice, having harnessed several of the dogs to sleds; others were coasting, near the observatory; while others again amused themselves constructing small sleds in the fire-room, which had been turned into a carpenter's shop. In their cabins they whiled away the time with cards, dominoes, checkers, and chess. The ship's company had been well selected. They were large and strong, understood their business, and were highly esteemed by the officers. Mr. Chester, the first mate, writes about them in the log-book: "Our seamen are a busy set of mortals. Go into their quarters at any hour between 8 a. m. and 10 p. m., when they are not at work on deck, and you will find them busy on various branches of work, such as shoemaking, patching, whittling out and rigging miniature ships, and, in fact, sailorizing of all sorts; and, what is better, perfect harmony prevailing among them. They are all *good* men. A better crew I don't think could have been found for an expedition like this. They keep clean and take good care of themselves. Everything about their quarters looks clean and neat. There is not much danger of such men being troubled with scurvy."

Divine service was held every Sunday, and, as a rule, all the ship's company attended. Between three

and four o'clock on the afternoon of the 2d, a most beautiful halo encircled the moon. The sky was clear and the circle of light was as bright as the moon herself. Vertical and horizontal rays extended from the moon to the halo, forming a perfect cross. At first this was faint, but it gradually increased in brightness, lasting about fifteen minutes, and slowly disappearing. The brightest portions were the cross and the spots where it met the circle of light. The next day a similar phenomenon was observed about 6.30 p. m. The sky was, however, then overcast, and the air was misty. The cross was very plain, although not so bright as on the 2d. There was no halo, but a bright spot to the east of the moon, forming a mock-moon, indicated where the circle would be. 1871. December.

On the 4th, Hannah commenced making skin clothing for the use of those who were going on sledge-journeys in the spring. Mrs. Hans Hendrick did not display any anxiety to assist Hannah in these labors; she probably felt that all her time should be occupied in the care of her children. By the 10th, all the dog-skins had been washed and prepared for making up into garments. Captain Budington remarks in his journal of this date: "All possible preparations are being made to succeed with our sledge-parties next spring. The time is passing very rapidly, and we must be prepared at as soon a time as possible, so as not to miss the best period for traveling—

1871. December. "the months of April and June." On the 6th, about 2 a. m., Dr. Bessels started over to the observatory, it being his tour of duty. A wind sprung up accompanied with heavy snow-drift. He lost his way, and after wandering around among the hummocks for some time, concluded that it was useless to attempt to find the observatory while the snow-drift continued. He accordingly sought shelter under the lee of an iceberg and waited there for the storm to abate. While there he kept account of the changes in the direction of the wind, which were duly recorded. After four hours' exposure, at 6 a. m., he reached the observatory; strange to say, he did not suffer any ill effects from this exposure. To prevent the recurrence of such an accident, the captain directed that a line should be stretched from the ship to the observatory. The natives built snow pillars at intervals of thirty or forty feet, on which a wire, covered with rubber, was stretched; the wire had been put on board the vessel for contingencies.

At noon of the 6th, the twilight arch was ascertained by measurement to have the height of 3° 16′. A remarkable change of temperature had taken place during the 5th instant. When the breeze from the southwest set in, the temperature rose in a single hour from —3° F. to +9° F.; it subsequently rose as high as +14°, the highest temperature observed during the month. On the

10th, the mercury rose to +11° from —3°. During the first half of the month the temperature ranged quite high, the lowest being —24°; on the 7th and 8th, the temperature was below —20°; the mean was about —11°. The last half of the month was, however, much colder. With the exception of the warm spell about the 19th, the temperature was nearly always below —20°; the lowest, on the 25th, being —33°. 1871. December.

The meteorological observations were recommenced after the storm of the 21st of November. Mr. Meyer remained at the observatory for sixteen hours, and Dr. Bessels the remaining eight, each day. Mr. Meyer's spare time at the observatory was employed in mathematical studies. He was an ardent, laborious student. He usually made all the observations from 9 a. m. to midnight, inclusive. On the 10th, during the greater part of the day a faint aurora was visible. Toward evening it became more brilliant, and underwent a variety of changes. At one time it was in the form of an arch stretching from S. W. to N. W., and rising to an elevation of about 20°. Hermann Siemens says: "We also saw numerous shooting-stars, sometimes forming, as it were, a silver thread, from the point where they first appeared to that of disappearance; in a few instances I have seen small fire-balls pushing out from them, similar to those of a rocket."

On the evening of the 16th, there was a brilliant dis-

1871. December. play of auroral action; innumerable rays shot up from the southern horizon, some of which passed through the zenith to the northern horizon. They were constantly changing; the northern rays disappearing, and the southern collecting in the S. E., and moving rapidly to the S. W, where they vanished.

On the 17th and 18th also, auroral displays were seen. No color was observed in any of these phenomena. They lasted several days, varying from day to day in form and motion.

The ice in the straits continued loose; the least atmospheric disturbance was sufficient to set large masses of it in motion. On the 9th of the month, the noise could be heard at the ship.

On the 8th, the land on the west side could be seen notwithstanding the polar night. Cape Lieber, the most northern land visited by Dr. Hayes, was in clear view, as well as land to the north and south of it.

On the 10th, open water was observed two or three miles distant. This was the period of springs. The ice about the shore was piled up in great confusion; but such was the accumulation about the berg that no apprehension of its moving was felt.

At times, and particularly on the 15th, a water-cloud over the patches of open water in the straits obscured from view the coast of Grinnell Land.

On the 17th, the open water was only one mile distant; the space it covered could not be distinguished from the deck. On the 19th, the pack was driven in by a westwardly wind, and this open space was closed. 1871. December.

On the 11th, the Polaris labored greatly; the creaking of her timbers as she moved up and down against the berg sounded like volleys of musketry.

On the 13th, Captain Budington remarks in his journal: "The berg, which is continually breaking in pieces (*i. e.*, from which pieces are continually broken), is pressed more towards the vessel. An old floe rests right against it on the sea side, and to the right and left of this floe the hummocks are piled up to the height of thirty feet above the sea-level; some pretty near as high as the berg itself." The effect of this constant pressure was to raise the vessel still higher, increasing her inclination at low tide. Thus her condition became worse and worse as the winter advanced.

The snow houses built by the natives after the southwest gale of November 28th were never occupied; in a few days after the storm had subsided they became re-assured and were content to remain on board.

In the mean time the ice was accumulating in the berths. This could not be otherwise; being against the sides of the ship, the berths could not be kept warm enough by the heat from the small cabin-stoves.

1871. December. Before the vessel broke adrift she was surrounded by a very deep snow wall, which kept the berths much warmer. The difference caused by the absence of this snow wall was shown by the thermometer. Several thermometers placed in a box near the stern were read three times a day for the captain's journal and the log-book. While the snow was about the vessel the readings agreed exactly with those of the instruments at the observatory. When, however, the snow wall ceased to exist, the instruments at the ship read from 2° to 4° higher, in consequence of which simultaneous observations were discontinued. In the forecastle the same difficulty did not exist. On each side were the coal-bunkers, and thus a large body of air was between the sides of the ship and the bulkheads, against which the seamen's bunks were built. In the lower cabin there was not much ice, for, although the berths were against the vessel's sides, they were somewhat protected. In the upper cabin the trouble was the greatest.

On the 11th, the carpenter was set to work making sleds for spring travel. The starboard alley-way having been given up as a dining-saloon was turned into a carpenter-shop, and here the carpenter worked for several hours each day. The alley-way received some heat from the galley, notwithstanding which it was cold; yet the carpenter worked faithfully, and turned out sleds both large and small.

Nearly every day the men were employed about two hours after breakfast in sweeping the decks and putting the ship to rights, in filling up the ice-house, and bringing provisions from the store-houses on shore. The dogs were regularly fed. Captain Hall had tried as dog-food a hash made of dried salmon and sea-bread; but as it was thought to have caused the death of several dogs it was given up. Captain Budington's first intention, after the seal-meat procured at the Danish settlement was used up, had been to prepare a mixture of bread and pemmican. Dr. Bessels, upon being consulted, did not consider it a good plan, because dogs are carnivorous; the captain thereupon determined to feed them upon pemmican alone. He remarks in his journal: "We must care for them as much as we do for ourselves. The whole success of the expedition depends on our dogs, for with our vessel we cannot hope to reach a much higher latitude." **1871. December.**

During the evening of the 20th, the moon shone with wonderful brilliancy upon the snow and ice, making every object, however distant, remarkably plain. Distant objects were brought so much nearer that Cape Lupton, four miles off, seemed to be within the reach of a short walk; and the same with Cape Lieber. The scene was solemn and impressive.

The 21st was not allowed to pass by without that

1871. December. notice which it always receives from Arctic explorers. The twilight had daily grown less and less, until it was nothing but a light streak over the southern mountains for a few hours each day. It gave no light, and was but just discernible. The long-continued darkness had become oppressive; the exclusive use of artificial light began to affect the eyes, and the trouble of carrying a lantern whenever one went out, was trying. The absence of light produced the physical effect of languor.

On the 24th, the men were invited to join the officers in the lower cabin at 8 p. m., there to celebrate Christmas Eve. The room was decorated with flags hung about the walls and festooned over the door. The name "Polaris" was exhibited in large, red letters on a white ground, and the table was loaded with good things. The stores of the vessel had been liberally drawn upon to furnish the requisite entertainment. The object of the greatest admiration was a Christmas-tree which stood in the middle of the table, a regular pine in appearance, filled with golden fruit and toys; wax candles burning from every bough added not a little to the effect. This tree possessed a peculiar attraction of its own. Through Dr. Bessels's contrivance one of the branches was made to bleed profusely, and the sap was gathered in glasses and pronounced delicious. After the company had been served from the bountiful table, and each had paid more than one visit to the flowing

branch, another feature of the evening's entertainment appeared. It was a lottery. Mysterious packages were produced and distributed as the numbers were drawn from a hat. They were not to be opened until 10 o'clock; but curiosity prevailed, and they were soon examined. 1871. December.

A great deal of amusement was afforded by the discovery that the packages contained toys, of various kinds, and small trinkets, which had been brought by Captain Hall for distribution among the Esquimaux children. The men enjoyed the joke exceedingly, and merrily twitted each other on the appropriateness of their respective gifts. "Big Fred," as Frederick Jamka was always called, amused the company very much by the answer he made to one who asked him why he could not have waited until 10 o'clock before he opened his package. He said it *was* 10 by his watch, and thereupon held up a little toy watch, the hands of which indicated 10 hours 10 minutes. With many toasts and remembrances of friends at home, and for the success of the enterprise, and with much fun and story-telling, a pleasant hour passed rapidly away. The only drawback to the enjoyment of the occasion was the shadow of Hall's death, which fell upon every one's thoughts. It was arranged to have a balloon ascension after the festivities of the evening, and all hands muffled up and gathered on the ice near the ship. The balloon was prepared, but the wind was so strong that all attempts

1871. December. to light the cotton proved unsuccessful, and finally it was torn to pieces. Another was brought out, and after many trials met the fate of its predecessor, much to the mortification of those assisting in its preparation and the disappointment of those who had braved the cold to witness its ascent. After these abortive attempts the two messes separated, but in their different quarters hilarity was kept up until a late hour.

Some objected to holding the gathering on Christmas Eve because it was Sunday night, and they wished to have it postponed until Christmas evening; but the majority would not listen to the postponement. The Germans, especially, insisted on its observance, and the others cheerfully yielded. The 25th was a beautiful day, and although the thermometer stood 33° below zero, the weather was exceedingly pleasant. Captain Budington's journal says:

"It appears as if Nature herself would join us in the celebration of Christmas day. The full moon changes night into day, and illuminates the straits as a chandelier does a ball-room." At 3 p. m., the cook served another of his elaborate dinners. In addition to the ordinary dishes made from the ship's stores, and which of themselves when presented in all their variety, constituted a very good bill of fare, special preparations appeared, which were the more relished as they were unexpected. Very

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good beefsteaks, taken from a portion of the musk-ox killed in the fall, gave the impression that butchers and markets, and other types of civilization, were not after all beyond reach. Next some roast pork from the pig killed in Upernavik was warmly welcomed. The spare-rib, notwithstanding its age of four months, was as fresh and sweet as though but just taken from the animal. Then, as if to shut out all ideas suggestive of Arctic snows and colds and horrors, among the desserts, mince-pie appeared made of fresh musk-ox meat, dried apples, raisins, &c.; it was unquestionably good, if the demand for it can be admitted as evidence of the fact. A few bottles of wine were broached.

At 8 p. m., a very strong gale sprang up from the N. E., blowing at times in violent squalls, accompanied by snow-drift. It was, however, of short duration, lasting only until 1.30 a. m. In the afternoon of the 26th, Joe and Hans reported quite a large body of open water about four miles from the berg.

On this day Captain Budington speaks in his journal respecting the position of the vessel as follows:

"On ascending the Providence Iceberg and taking a look around, we see at first the open water at a distance of from three to four miles, extending the whole length of the strait from north to south. Our vessel lies on the edge of the land-floe, protected from seaward by the iceberg.

1871. December. "She heads to the southeast. She is protected from any danger in that direction by a considerable bergy mass of ice, which seems to be grounded and partially kept from going adrift by our Providence Berg. Her stern has a safeguard in the form of a large piece of our iceberg which was broken off during the last gale that broke us out of our position. It now appears to be aground not far off our stern, and which will stop the progress of floes in case the land-ice should become broken. The only danger, therefore, that threatens us is from the sea side, and this in the form of southwest gales, in connection with spring-tides, which may push the vessel further in shore. She will then have only two chances. She must either resist the pressure of the berg and break the land-ice, which has already acquired the thickness of three feet, or she will be lifted up out of the water, which would, however, not occur without the loss of rudder and propeller. This could only be effected by a strong gale of several days' duration. The ice before the berg must first be set in motion before, even with the aid of spring-tide, Providence Berg could be driven in. With northeast winds, the prevailing ones here, we generally have a very low tide; therefore it is almost impossible for the berg to go adrift before spring. We are, however, in by no means a safe position."

He then goes on to express his regret that his

advice in regard to winter quarters had not been followed. The vessel, according to his idea, would have been safely anchored in Newman's Bay, and entirely free from all the dangers by which she was now beset. There would have been no drifting in the pack, no breaking out, no subsequent force upon the berg, and no daily motions in her icy bed, had the vessel been guided as his experience directed. She would have wintered at least twenty miles further north, and nearer the musk-ox feeding-grounds. **1871. December.**

"On the 27th, the atmosphere was foggy and the whole heavens overcast with low stratus-clouds. The moon was slightly visible through the fog, having a large halo." The vessel's position was so uncomfortable that life on board became almost unendurable; at every low tide she lay over to port, almost on her beam-ends, and it was desirable, for several reasons, to attempt to get her off from the berg and enable her to remain upright. Not only were her constant movements sources of inconvenience to her occupants, but it was feared she herself would sustain serious injury. Her rudder and propeller were so far under the ice that they could not be seen, and many thought they had become fastened in, so that when the vessel lay over she broke them off and left them in the position in which they were when frozen into the ice. It was argued, too, that this constant motion while the

1871. December. bow remained perched upon the tongue of the berg must necessarily result in wrenching the bow and breaking off the keel. Little hope, however, was entertained that much could be done toward the liberation of the vessel until late in the spring, when human efforts would be aided by the powerful influence of the sun. Nevertheless an attempt was made in that direction on the 28th. It was perhaps done more to give employment to the men, and by a little excitement break the dull monotony of ship-life, than with the expectation of doing much good. Four large charges of gunpowder were exploded under the ice in different places not far from the ship's side, but, beyond jarring the ice and the vessel, no effect was produced; the ice was not even cracked.

Luminous streamers were seen on the 29th, extending in an arch from northeast to southwest through the zenith.

On the 30th, the Esquimaux reported open water within one mile of the vessel. It could not, however, be seen from the summit of Providence Berg, as the straits were covered with an impenetrable black fog. On the last day of the year the twilight was brighter than it had appeared for a long time. The sky was perfectly clear, and the moon, being in the northwest, was very distinct. Some thought that they could detect a light straw color quite near the horizon. This rapid and marked increase in the extent of the twilight arch was very gratifying, and

was the subject of constant remark. Then speculations as to future movements always followed. Perhaps no one thing was more talked about than the question of the probable success or failure of different plans for carrying out the objects of the expedition. 1871. December.

Divine service was held as usual at 11 a. m. Precisely at 12 midnight the ship's bell was rung merrily to welcome in the New Year. A bowl of hot punch was brewed, according to the most approved plan, by Dr. Bessels. The men forward fired a salute and sent a delegation to the cabin to congratulate the officers on the occasion. This was very kindly received, and thanks were returned for their courtesy, with the assurance of the officers' continued good will and kind wishes. Profiting by their experience on Christmas Eve, and favored by calm weather, the balloon managers were successful, early on New Year's day, in sending up a balloon. Nearly all the ship's company were out on the ice to watch it as it was carried away by the light wind just felt from the east. After stopping a minute in the rigging, it rose and moved off to the westward, until it entirely disappeared. When it had passed out of sight all were invited into the cabin, where the remainder of the punch was made to disappear in a remarkably short space of time.

The amount of coal used during the month of December was as follows:

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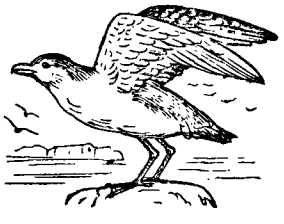
	Pounds.
Cabin	1,882
Forecastle	1,920
Galley	2,898
Observatory	1,360
Total	8,060

This was an increase upon the consumption during the month of November, but not more perhaps than was to be expected from the decrease of temperature and the exposure of the vessel's sides for want of a snow wall. Captain Budington, in his journal of January 2d, thus speaks of the coal-supply: "We try to save coal in every possible way. The fire in the galley-stove is extinguished after dinner is over, at 3 p. m. Even the ashes, after having fallen through the grates, are returned to the stoves, in order to save the small particles of coal that might slip through and thereby escape their destination. A commission, appointed on the 8th of September, 1871, by Captain Hall, to report on the amount of coal in the bunkers, estimated it to be about one hundred tons. Since then we have used so much coal that we are better able to inspect and estimate the remainder, and are satisfied that there must have been some mistake, and that there could not have been more than eighty tons. If the consumption of this fuel is continued at the

"same rate, a stoppage of which, without endangering our health, is not possible, we will hardly have enough for two winters, to say nothing of using steam on our return. The idea of piloting the vessel through Smith Sound with the aid of sails is an absurdity. Without considering the safety of the vessel, the experiences of both Kane and Hayes are sufficient to show that a sailing-vessel, and especially one like ours, can do absolutely nothing. The first opportunity, however, we get to leave this winter-harbor will be taken, and with the aid of steam or sails, as conditions permit us, we will attempt to reach a higher latitude, so as to enable us to carry out the objects we are sent for." **1871. December.**

The winds during December were extremely variable. Those from the N. E. were the most frequent and violent; the S. W. storms were next in duration and severity. There were many days of total calm, and on others light winds blew from different directions. The sky was rendered cloudy by the proximity of open water; heavy, and at times impervious, fogs prevailed.



XII

CHAPTER XII.

For several hours during the morning of the 2d, the men worked very hard to loosen the ice under the vessel, in order that she might be on an even keel. A deep ditch was cut at a distance of 15 feet from her, in which holes were made through the ice which was from 4 to 5 feet in thickness. Then four large bottles of powder were introduced under the ice, by means of long poles that served to regulate the positions of the bottles. The fuses were ignited at the proper time, and the bottles exploded simultaneously. The result was a disappointment. The ice was but jarred, particularly near the vessel, so that those on the ice felt the shock. It was evidently the idea of some that the whole body of the ice between the ditch and the vessel would be broken into atoms, and fragments cast to a considerable distance. Accordingly, when the fuses were lighted, there had been a retreat for protection. This was very amusing to those who remained near the holes. Mr. Chester, in his comic manner, as soon as he

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1872. January. noticed this movement on the part of some of the men, ridiculed it by feigning the utmost fear, and ran with all speed far beyond any of the men, ensconcing himself behind a large berg. He climbed up the berg on the side farthest from the vessel, and after the explosion, his head appeared over its top, and in the most anxious tones he inquired if all were safe. After repeated assurances he cautiously approached the ship. The ice was not seriously affected; it was not even cracked. But the shock to the vessel was so great that it was considered imprudent to explode a larger quantity of powder, and the idea of relieving the vessel in that manner was abandoned.

With the aid of Mr. Schumann and fireman Booth the pendulum was erected near the west side of the observatory. Dr. Bessels superintended its erection, and formed the plan by which the box in which it swung was so securely supported that its oscillations could not be affected by any extraneous movement. His account of this is as follows:

"PENDULUM EXPERIMENT.

"The pendulum is an invariable, reversible brass pendulum, of 5 feet 7.75 inches in length, and very near synchronous, but not convertible. It is swung on steel knife-edges, and suspended in a box of strong board with a glass door. In order to disconnect the instrument as far as possible from the small building in which it was swung, a

"square hole was cut through the floor in the middle of the western wall of the observatory. Underneath this opening a heavy piece of timber was frozen solid to the ground. As the floor of the hut did not rest directly on the soil, but was placed on beams of oak, the plank mentioned before was entirely isolated from the observatory, and became as firm, under the influence of the low temperature, after the course of a few days, as the frozen soil itself upon which it rested. On this piece of timber the pendulum-box was screwed in such a manner that the plane in which the pendulum was swung was that of the meridian, and in order to secure the utmost steadiness a barrel was placed outside the observatory on the same plank on which the pendulum-box rested. The barrel was surrounded by a heap of gravel, which was moistened with water in order to cement it in a solid manner to the plank. After this was done a hole was cut through the wall of the observatory behind the place where the pendulum-box was fastened. A half-inch iron bar, bent at right angles, was passed through this hole, and one end of it was fastened to the back wall of the box by means of five screws. The other end, which was about three feet over the center of the barrel outside of the observatory, was screwed to a three-inch iron bar set up nearly perpendicular in the keg.

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"After having accomplished the work so far, the

1872. January. "barrel was filled with gravel and sand, over which was poured some water. Before the mass was frozen hard we leveled the pendulum-box as nearly as could be done, and when it was found to be tolerably level, the bar outside was fastened by means of ropes to the wall of the observatory, in order to prevent it from giving way and disturbing the position of the box. After two days had elapsed, the gravel was frozen solid and the ropes were removed. It was found that the box had not changed its level; but, at the same time, it was not so steady as might have been expected. To secure it better, a hole of three inches diameter was drilled through the floor of the observatory, about one foot north of the box, and another one of the same diameter and at the same distance south of it. Through each of these holes an iron bar, one inch thick and three feet long, was driven into the frozen soil and connected with the box by means of two other iron bars bent at right angles, similar to the one mentioned above, and screwed together in a similar manner.

"The vibrations (performed in the plane of the meridian) were observed with a small direct-vision telescope placed about eight feet east of the arc of the pendulum. The point of the swinging knife-edge served as a mark, and observations were made with vibrations from right to left (north to south) and from left to right to correct for eccentricity of mark. Each set was begun with right.

"An arc of a circle of 39.25 inches radius, divided from the middle each way to five degrees, with subdivisions of tenths of degrees, was placed over the swinging knife-edge, and the extreme excursions to the right and left noted. The times were recorded by a sidereal chronometer, which was compared with five other box-chronometers, by means of a pocket-chronometer, before and after each set of observations was taken. The pendulum was swung in four different positions designated by the number stamped on the rod near the knife-edge; the number facing the telescope thus indicating the position; the numbers 1 and 2 being on one side, and 3 and 4 on the reverse. The steel plates upon which the knife-edge rested were leveled by a small spirit-level every time before the set was begun, when the door of the box was closed and kept shut till the set was finished." **1872. January.**

The pendulum had been ready some time, but it was not until the 2d, that observations were begun. Mr. Bryan, who had charge, had been occupied with the transit instrument in observing moon-culminations.

During the 3d, a strong breeze from the N. E. prevailed, reaching a velocity of forty-five miles, and at times blowing in violent squalls, but at 5 p. m., suddenly it died away. At 9.30 a. m., of the 4th, an arch of luminous streamers extended from N. E. to S. W. through the zenith. The twilight into which one end of the arch

1872. January. vanished, extended from southeast to southwest. It had now become so luminous that the elevated points on the mountain-range were remarkably distinct. Near the horizon a yellowish hue was seen.

On the 5th, as Hermann Siemens was making the tidal observations, his attention was attracted by the cries of a dog apparently coming from the starboard bow. He found, on going there, one of the little puppies fast in the ice. It had been caught in the ice when it closed by a change in the tide, and was unable to free himself; it was liberated by a hatchet, and restored by being placed near the stove.

Nearly all day on the 6th, beautiful auroral displays were seen. During the morning, luminous though faint clouds were observed in different parts of the heavens. At 3 p. m., the sky being clear and the breeze light from the south, these clouds, in the form of an arch, extended from northeast to southwest, enlarging toward the northeast and accumulating above the mountains. In half an hour they resumed their original shape, and appeared in the form of light yellow and white bands. These phenomena were present during the whole evening, being seen in every direction. Fantastic forms of light came and went rapidly, and a frequent appearance was that of a cirro-stratus cloud. On the morning of the 7th, a perfect arch extending from north to south was

observed. It consisted of uniform bands of yellow and white. **1872. January.**

Divine service was held as usual at 11 a. m., in the lower cabin. The minimum temperature for the previous twenty-four hours observed at 8 a. m. on the 9th, was —48°, the lowest that had been observed up to that time. Throughout the 9th, the weather remained fair and cold, but at 1 a. m. of the 10th, a fresh gale from the N. E. sprang up, accompanied with snow.

Siemens says in his journal that on the 10th, at 5 in the morning, a bright arc was seen in the sky passing from the western horizon through the zenith to the east, parallel with the milky way, and distant from it about 12°. It disappeared about 6 a. m., leaving three clouds of similar brightness. This phenomenon, if electric, did not show itself in the needle. Narrow bright strips were distinctly seen running into the arc from the south. At the same time luminous streamers of a greenish hue were shooting up from the eastern horizon. The atmosphere was very hazy at the time, and only stars of the first magnitude could be seen. Siemens thought the phenomenon an aurora.

Spring-tide came on the 10th, but was kept down by a strong wind. An unusually low tide on the 11th, caused the vessel to hang over even more than she had done. To move about the deck required a great deal of care.

1872. January. The preparation of sleeping-bags for the spring travelers was now begun. One or two had been bought in the Danish settlements; others were made from skins in store and covered with canvas. At 9.30 p. m. of the 11th, a very strong gale from the northeast commenced, continuing with unabated force during the morning of the 12th. The squalls were very violent, and the air was filled with the thick snow-drift.

At 10 a. m., an aurora was observed, which is described in Budington's journal. Two imperfect bands of parallel luminous clouds extended from northeast to southwest, passing into an arch on both sides of the zenith, exhibiting a light yellow color toward the north, and a pure white toward the zenith, where they were somewhat more faint. Their appearance and shape toward the north were those of broken cirro-stratus clouds; while the part of the arch south of the zenith was a long, uninterrupted, somewhat faint band, milk-white.

On the 14th, at 7 p. m., there was a perfect arch, of a white color, on the eastern horizon; it was very distinct, and from it beams shot toward the zenith. No other motion was visible. It commenced from the star Arcturus, and passed the constellation Leonis, a few degrees southeast of which it vanished.

On the 16th, twilight was visible as early as 8 a. m.

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The ship's company began to look forward to the time when there would be no night and active spring-work would begin. It was a source of the greatest gratification that all were as healthy as when the sun had disappeared. No case of sickness had occurred, and the scurvy, that special dread of Arctic travelers, had not shown itself in even the slightest form. As the sunlight increased, so that one could look upon another without the aid of artificial light, it was noticed that the long confinement had bleached the skin and given a peculiar pallor to the face. There was nothing, however, in this to cause anxiety, as each one felt that he needed only a few days' sunlight to be entirely restored to his usual strength. The good health of the men was unquestionably due to the mild and judicious discipline of Captain Budington. His idea was to keep the men during the Arctic winter warm and comfortable; to indulge every reasonable request and make them contented; and to encourage them to take voluntary exercise. He held that by this course the danger of scurvy would be lessened, and accordingly he directed only such labors as were indispensable; the people, when thus called upon, entered upon their tasks with interest. He allowed them the fullest liberty to come and go according to their own pleasure while conforming to the rules of the ship. He supplied them with guns and ammunition, and encouraged them to go in quest of game. Their food was carefully

1872. January. selected and prepared, embracing as much variety as the condition of the ship's stores admitted. Pork was the only salt meat on board, and there were several anti-scorbutics. It is, however, by no means certain that salt meat alone causes the scurvy. The Esquimaux are troubled with it, and they feed entirely on fresh meat, getting salt only from the sea-water, which is occasionally used to boil their meats. The disease does not proceed from food only, but depends also on the situation and the state of mind of the patient. Where there are severe labor and exposure, the predisposing causes are strengthened.

On the morning of this day, from the top of Providence Berg a dark fog was seen to the north, indicating water. At 10 a. m., three of the men, Kruger, Nindemann, and Hobby, went to Cape Lupton to ascertain, if possible, the extent of the open water. On their return they reported several open spaces and much young ice—not more than a day old—so thin that it was easily broken by throwing pieces of ice upon it. The large floes on the borders of the open water were moving, as they judged from the sound, but they were not able to distinguish the direction in which they were drifting. Late in the evening Hans started out to the cape for the purpose of hunting in the open water. The moon was very near the horizon, so that he was not much assisted by its light. He saw no open water, it having been covered with young

ice since the morning visit of the men. Hans thought he heard a walrus blow, but could not see the animal. **1872. January.**

Early on the morning of the 17th, Captain Tyson and Joe started for Cape Lupton in time to arrive there at meridian, when the twilight was brightest, that they might examine the condition of the ice in the straits. Upon their return they reported that no water was to be seen, and that the straits appeared to be covered with young ice, not strong enough to bear their weight, mixed with large floes which seemed to have just drifted together. A low cloud of frost-smoke was seen toward the western coast of the channel.

The carpenter, who had been for a long time employed making sledges, finished his work on the four small sleds and commenced the construction of the large ones. The little sleds were designed for individual work. It was supposed that there might come a time in the course of the spring sledge-journeys when the large sledges could no longer be used, and, in order to be provided for such an emergency, these smaller sleds were built. The plan in this case was for the members of the party to start on, with the small ones, each dragging his own provisions. The sleds were all ready for service except shoeing the runners.

Mr. Schumann made a thorough examination of the engine, and found that it was in excellent order, not

1872. January. having been injured in any way during the winter. It was now overhauled and cleaned.

The twilight at noon of the 19th, is described as being brilliant, exhibiting prismatic colors of great beauty. The effort to obtain a spectrum from the twilight was unsuccessful. Mr. Meyer had been engaged for nearly two months in meteorological observations during sixteen hours each day. He was getting worn out; the continued strain was too much for him. He found that he must begin to husband his strength for the labors of the spring. J. B. Mauch, who had, since the death of Hall, been writing the journal for Captain Budington, was selected to relieve Mr. Meyer of part of his duties. Mauch having been instructed in the reading of the instruments and recording the observations, and being clever and well educated, Mr. Meyer did not hesitate to intrust him with the charge of the meteorological observations during one-third of the day. He accordingly commenced on the 19th, to make observations from 11 a. m. to 7 p. m.

The same day Robert Kruger and Frederick Jamka made an excursion toward the north. The following is the narrative of their journey:

"Soon after 3 p. m., we left the vessel with a sled and team of eight dogs, with the intention to reach the second cape north. On going round the first cape (Lup-

ton), the change in the ice struck us; for about three weeks ago it was full of hummocks, intermingled with bergs larger than our Providence Iceberg. Now, all this had changed, and a new field of ice covered the waters, free from any hummocks or bergs save those that had been pushed up on shore. On arriving at the second cape, we left the dogs and sled in a safe place, and started to ascend a hill about one hundred feet above sea-level, from whence we would be able to enjoy a good view to the northward. Not far off the land a vast amount of open water appeared, extending to the northward as far as we could see, and bathing both shores in its waves. The moon, at the time, was shining so brightly that, by our estimation, we were able to see twenty miles ahead. At that point the straits seemed to get narrower. Having stopped there about a quarter of an hour, we concluded to return. Between the second and first cape we had to force our way against a strong breeze from the southwest, which was accompanied by a violent snow-drift; the wind entirely ceased as soon as we rounded the first cape. The whole excursion lasted about four hours. We were obliged to stop the dogs several times to disentangle their lines, especially on our way back to the vessel."

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While this party experienced a strong southwest gale, a light breeze from the east was felt at the vessel.

1872. January. On the 21st, at 12 o'clock, divine service was held as usual. The temperature was, part of the day, up to zero, and a light snow fell during several hours.

On the 23d, the two Esquimaux, accompanied by two of the seamen, went to Cape Lupton. They reported a sea of open water extending as far as the eye could reach.

On the 24th, Dr. Bessels, with two of the seamen, started at 11 a. m., with a dog-team, to go north and examine the water reported by the seamen. They reached the third cape without difficulty. Leaving their sled, they arrived at the open water about 2 p. m. They reported a current there running to the north at a rate variously estimated from four miles to half a mile per hour; at the same hour at the vessel the tide was falling. At 7.30 p. m., Mr. Bryan and Mauch left the observatory to walk up to Cape Lupton. They took the ice, as affording smoother traveling than the shore. About half-way up they met Hayes, who was just returning from a tramp to the third cape; he had found a thermometer-case, which had been dropped by Dr. Bessels. They pursued a narrow way between the steep *débris* of the cape and a row of stranded icebergs, which was large enough for the passage of a sled. After passing the cape they ascended a hill, from which there was a good view of the straits. About three miles from the shore a narrow channel of water extended

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to the north, the end of which was invisible. The moon was very bright, though partially obscured on their return journey by a light mist. Presently a large halo appeared, exhibiting, on its lower part toward the south, faint spectrum colors. Mock-moons, were seen—sometimes one and sometimes two on either side. They reached the vessel at 10.30 p. m., after a walk of about eight miles.

On the 28th, Mr. Chester and a small party with dogs and sled, went to inspect the open water which now prevented their rounding the third cape. Mr. Chester observed a current of one mile an hour toward the north. The existence of this open water was regarded as favorable to boat journeys in the spring. A large sled was ordered, upon which one of the boats could be transported to the open water, the extent of which it was proposed to ascertain as soon as possible. Toward evening, the sky cleared, and the western coast could be distinctly seen.

On the 26th, Mr. Bryan had commenced making observations with the magnetometer. The plan was to continue them for a few months with hourly observations, excepting on a term-day each week, when they were to be made every six minutes. Dr. Bessels and Mr. Meyer both assisted and read the magnetometer during the hours of their watch at the observatory. For several days there

1872. January. was a precipitation in the form of ice-crystals, which covered everything, and accumulated in great masses on any metallic surface.

On the 28th, Divine service was held as usual at 12 o'clock.

On the 29th, a small arc of twilight was visible above the western horizon at 5 p. m. On the 30th, the twilight at noon made it sufficiently light to read small print. At 4.30 p. m., two faint bands of luminous clouds were seen extending from northeast to southwest. At 5 p. m., a streamer was seen extending from Regulus to Altair, where it vanished before the twilight arc. This streamer was in the form of an arch, and very irregular in its illumination, some parts being quite faint. It was brightest in the east where it commenced, and Regulus shone through its most illuminated part. During the whole of the display, Mr. Bryan sat watching the magnetometer, but no deflection occurred attributable to the streamers.

On the 31st, a very heavy gale from the northeast commenced to blow, increasing in violence until it had acquired in the afternoon a velocity of 44 miles per hour. It was accompanied by snow-drift, which rendered exposure by no means a trifling matter. A snow wall was formed about the vessel 4 feet deep. It was almost impossible to read the instruments; the snow-drift filled the

eyes and froze the water with which they became suffused. Notwithstanding that the observatory was well banked up with snow, there were still a few cracks exposed, and through these it drifted, making three heaps upon the floor. The observer was compelled to shovel out the snow, and his watch was a cold and cheerless one in spite of a good fire. **1872. January.**

During January, the highest temperature was + 3°.2 F.; the lowest, — 43°; the mean, — 21°. 9. The gale which commenced on the last day of January continued throughout the 1st of February. The snow-drift was remarkably heavy, and filled up the tide-hole so rapidly that it was found impossible to keep it clear, so that the observations were necessarily omitted. The wind blew with the greatest force between the hours of 6 and 7 in the afternoon, when the anemometer registered a velocity of 53 miles. As it blew in squalls, there were times when its velocity was much greater. The temperature during the severest part of the storm was — 22°. Facing such a wind at this temperature was by no means comfortable or safe.

The coal used during January amounted to 7,262

1872. January. pounds, making a decrease of 798 pounds from the amount used in December. The consumption was distributed as follows:

	Pounds.
Cabin	1,673
Forecastle	1,726
Galley	2,274
Observatory	1,589

XIII

CHAPTER XIII.

1872. February.

The 1st of February was one of the magnetic "term-days." The observers had a severe time, remaining continually in the cold snow-house, and jotting down every six minutes the reading of the magnetometer. They had, however, a small deer-skin bag in which they encased their feet and legs, and were able without any very great discomfort to remain there several hours at a time.

On the 2d, the heavy snow-bank was cleared away from the fire-hole, and the tidal observations were resumed. Although the sky was overcast, the twilight afforded sufficient light to read the anemometer at meridian.

On the 3d, the carpenter finished one of the large sledges for transporting the boats. It was 14 feet long, and 2½ feet between the centers of the runners, which were 2½ inches thick, and 10½ inches high. Fourteen cross-bars, 4½ by 2½ inches each, were fastened by strong lashes of raw-hide to the runners, which thus had a play

1872. February. of about six degrees; moving easily ahead at this angle. This play of the runners was a great advantage when transporting a heavy load over rough ice; it is a feature common to all Esquimaux sleds.

The twilight was now so bright that any kind of print, from fine diamond up, could be easily read. A spectrum was for the first time observed. Only stars of the first magnitude could be clearly seen. Mauch thus records an observation of a meteor:

"At 4.30 p. m., when making my observation, and just attempting to read the anemometer, I observed in the east, above the range of hills, a bright meteor slowly moving in a southerly direction toward the ground, at an angle of 45°. Its height when I first saw it was the same as that of Procyon. It was of a light bluish color, resembling closely in its whole appearance the blue light that falls from some kinds of rocket, when they burst in the air. Before it disappeared behind the hills, it left a few sparks behind, which, however, were soon extinguished. Its size was that of one of the stars of the first magnitude."

Parties of seamen now went every day to Cape Lupton to examine the open water.

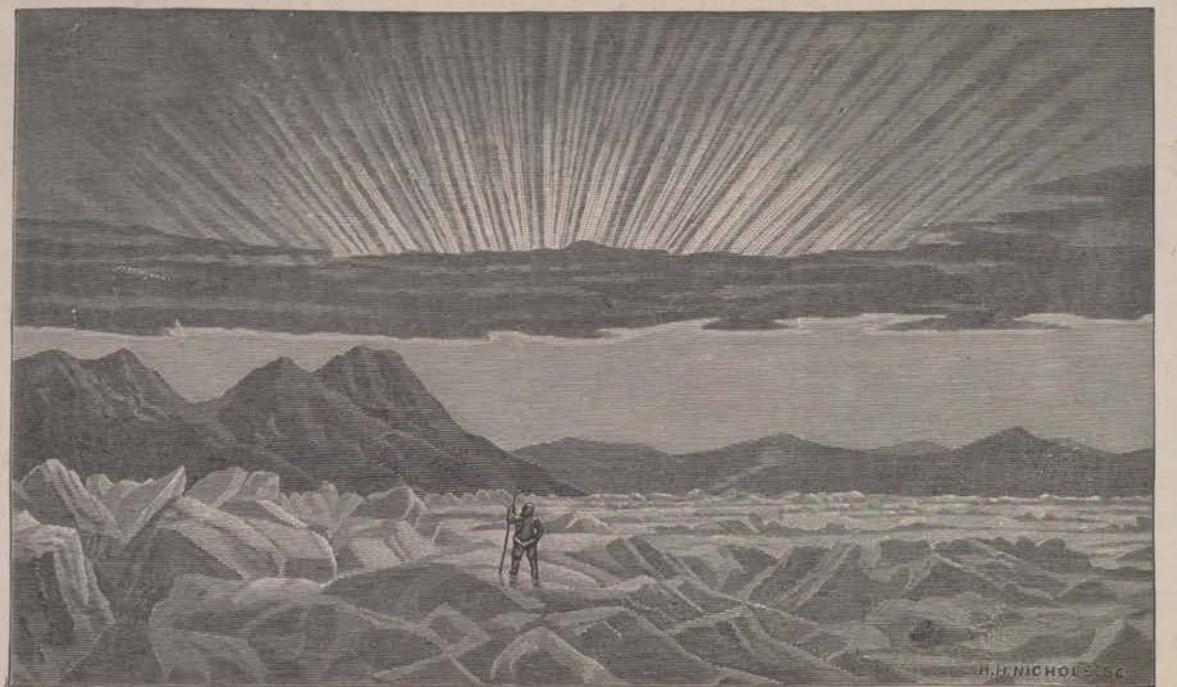
Twilight lasted on the 4th, from half-past six in the morning until half-past five in the afternoon. Divine service was held as usual at 12 o'clock. During the entire

day remarkable disturbances in the motions of the magnetic needle were observed. As was expected, a very fine auroral display was witnessed in the evening. The movements were many and complicated, and the spectacle grand in the extreme. Doctor Bessels stood outside the observatory sketching and taking notes of the rapid changes of the phenomena. He held a string leading into the magnetic snow-house, where Mr. Bryan sat watching the magnetometer. The doctor pulled the string when changes occurred, and Mr. Bryan being thus warned noted the time and read the magnetometer. In this way they were able to trace the effect of various combinations and movements. **1872. February.**

It may be said, in general, that the greatest disturbance occurred several hours before an aurora was visible. The following short description of the display is condensed from Mauch's journal: At 7 p. m., as I was returning to the ship from the observatory, I noticed the slaty appearance of the sky to the northwest and the occasional shooting up of luminous streamers. At 7.15, the horizon to the northwest was of a blood-red color, while faint, white streamers sprang up in rapid succession, increasing in numbers, and rising from the west, north, and northeast points. They were all directed toward the zenith, and the exterior ones bending inwards gave to the whole configuration a dome-like shape. They then all vanished, and

1872. February. new ones began to rise slowly from a wider extent of horizon. At 8.30, new and very bright streamers advanced toward the zenith from all directions. At 8.45, they all gathered about the zenith and formed a perfect corona. They then all seemed to move toward the north, as new ones arose from the south. Mauch watched the progress of these streamers while passing over some stars, and assigned to them a motion of between six and seven seconds to a degree. They moved from west to east. As the corona opened and moved toward the north, a beautiful curtain was formed, its color being very intense and bright, between yellow and white. This was the general color of all the streamers except those in the northwest against the deep-red sky, which seemed to take that color. At 9.30, another corona was formed by new streamers coming from every direction of the compass. This separated like the first one, moving toward the north and forming, before it vanished, a similar curtain. This latter display was much more brilliant than the first. At 9.40, the red part of the horizon inclined more toward the north and northeast. The auroral display lasted all night, and continued, with slight interruptions, throughout the 5th. The red color of the sky moved around during the night, was finally seen in the east, and disappeared in the southeast before twilight.

"At 3.30 p. m., I observed," says Mauch in his



An Aurora.

journal, "on the northeast, east, and southeast horizon, beams of luminous clouds. They soon accumulated and formed an irregular arch due east, which slowly moved, as if driven, in a southerly direction. At 4 p. m., a new arch extended from nearly due east to nearly due south. At 4.10 p. m., three distinct arches, one above the other, were formed slowly in the southeast and south, exhibiting a very brilliant display, though fading very soon away. Those to the south were of an intense straw-color, and formed a brilliant spectacle. At 4.30 p. m., more streamers were coming up from the southeast and south. In the former direction they formed nearly the shape of an egg, very regular and of the greatest brilliancy. At 4.40, they seemed to move around to the south; no more coming up in the northeast. I might say they follow the twilight, showing their brilliancy right alongside, as if they would ask which one we liked best." Hermann Siemens, in his journal, speaking of the rays combining as it were to form a sort of screen or scroll or curtain, and moving until they disappeared only to be followed by others, says: "It was as if a regiment of troops retreated before an enemy closing in upon them." **1872. February.**

A party went again to the cape and reported that there was young ice over the open water, and that toward the western side a water-cloud was visible. The Esquimaux in their wanderings over the land found the tracks

1872. February. of a wolf, only a few days old. This was very encouraging news to the sportsmen.

On the 7th, the water had risen around the vessel to the depth of 18 inches above the surface of the ice. The tides kept open the cracks about the iceberg. So much snow had drifted over the ice near the berg as to make it too heavy to be raised by the tide. Thus the ice was greatly increased in thickness; a portion of the water freezing and not running back on the fall of the tide.

The following extracts are from Mauch's journal: "Between 5 and 6 p. m., I assisted Mr. Bryan in taking some altitudes of Jupiter, but then not much could be done as the temperature ranged too low (—30°). It was a hard trial for both of us. The nose suffers more than anything else. The fingers also feel the effects, especially the points, as the nails that cover them produce a fearful sensation."

At 5.30 p. m., on the 8th, "I observed a very bright luminous arch of streamers somewhat extending from the northeastern horizon to the southwestern. When I first saw it, it was a little to the northwest of the zenith, but the whole arch seemed to move, and at 6.30, it just passed the zenith, and then had a position southeast of it, where it gradually broke up. Its southwestern extremity just touched the twilight curve, where it vanished. At 6.30, the usual haziness of the sky, after the occurrences of these, was noticed."

Mauch paid a visit to Hall's grave and found that it was undisturbed. Everything about it was in good order, just as it had been left in the autumn. 1872. February.

On the 10th, while on one of those short excursions, that were now frequently made by the members of the expedition, he visited Lookout Mountain, and, from its summit, witnessed a remarkably rapid change in the atmosphere, which he thus describes:

"I had for a short time a very extensive view over the straits where the open water appeared as a dark black spot on a white field. My joy and pleasure did not, however, last long, as fifteen minutes only sufficed to cover all by a most impenetrable fog—a phenomenon which I never observed before in winter. I was hardly able to see twenty paces to the west and northwest, though toward the south it remained free for a considerable time. There, above the new ice of the bay, a most beautiful fog-stratum, intensely white, was hanging, and continually changing its height."

Divine service was held, as usual, in the lower cabin, at 12 o'clock on the 11th. On the 12th, the Esquimaux went to the open water and saw two seals, but were unable to get them because they were beyond the reach of their rifles. The ship's company was much in need of oil for their lamps, all their original supply together with that taken from the seals killed during the winter, having

1872. February. been consumed. They were at this time using kerosene oil, and, the supply of that not being large, strict economy had to be practiced. It was therefore important that seals should be killed, and the natives, each day, on returning from their hunt, were closely interrogated as to their success.

On the morning of the 13th, southwesterly breezes brought the temperature up to within six or seven degrees of the zero point. The whole crew were out on the ice, taking advantage of the fine weather, enjoying themselves in various ways, some at target-shooting and others in different games. The ice about the vessel presented a gay and lively scene. Parties were out hunting all day. Joe fired at a seal, but lost it in the ice. On the 15th, beautiful crimson clouds were seen in the south, reflecting some of their colors to others in the east and northeast.

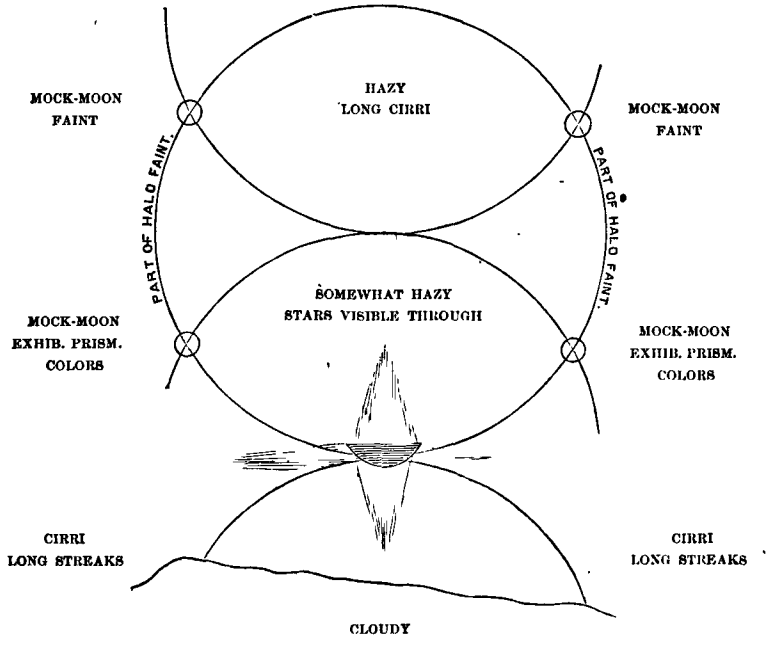
On the 17th, a remarkable fall of the barometer was observed. During one hour it fell .09 of an inch. From 8.30 a. m. to 4.30 p. m., the fall amounted to .481 of an inch. From midnight to midnight the entire fall was 1.16 inches—from 30.098 inches to 28.938. At 2 a. m. of the 18th, with the fall of the barometer and rise of the thermometer, came, as usual, a southwesterly gale, increasing in fury and accompanied by a heavy snow-drift. The greatest velocity observed was 58 miles per hour. Early in the morning the thermometer reached its greatest

height, at + 8° F.; a great change since the 16th, when the mercury was frozen. The effect of the wind was noted in the tidal observations. For twelve consecutive hours the height of the water was about the same, the difference between high and low water being but little more than one foot. The barometer began to rise as rapidly almost as it had fallen. The gale continued blowing in heavy gusts until daylight of the 19th, when the wind shifted to the west and northwest. The thermometer fell rapidly, while the barometer remained stationary. A gale from the northeast, commencing at noon (a light snow having fallen since 10 a. m.), blew with great force, reaching a velocity of 57 miles per hour. Soon after midnight it lulled for a short period. **1872. February.**

At 8 a. m. of the 20th, it was howling through the rigging, making a fearful noise. All the snow that had been carried northward by the southwest gale was returned with interest. The air was filled as high as the top of the masts, and so thickly that objects more than ten feet off could not be seen. The banks alongside the vessel were much increased. At 3.40 p. m., the storm had died away, a scarcely perceptible breeze blowing. The straits, which had been completely filled with ice by the southeast gale, were cleared out, and a large body of open water could be seen not more than three miles from the ship.

1872. February. The preceding account of the two storms is typical; the number of storms of such a character recorded in the journals is very large.

Early on the morning of the 21st, Mauch was called by Hermann Siemens to observe some very beautiful paraselenæ. The moon, a little west of the meridian, was not quite full. Mauch made the following sketch at the time; the thermometer was 30° below zero.



It was so light at midday that no stars could be seen.

Dr. Bessels now addressed the following communication to Captain Budington:

1872. February.

"WINTER-QUARTERS,

("*Latitude* 81° 38′ *north, longitude* 61° 44′ *west,*)

"*February* 21, 1872.

"SIR: As with the return of the sun the further operations of the expedition must be begun, and as, in regard to all these, a consultation between us should take place, I forward herewith to you the sketch of a plan by means of which, as I think, we may best fulfill the mission upon which we are sent.

"Very respectfully,

"EMIL BESSELS.

"Captain S. O. BUDINGTON,

"*United States Steamer Polaris.*"

SKETCH OF A PLAN OF OPERATIONS.

"As matters stand now, there are two ways of accomplishing the object of the expedition: either by boats and the vessel herself, or, as at first proposed, by sledges. Let us now consider both ways, and the plan of operations for each that seems to offer the most advantages.

"The setting out of a boat party will, of course, depend entirely upon the area of open water and the improbability of new ice being formed that would interfere with its navigation. Perhaps the party could start during the last of March or in the beginning of April—that is to be seen—if the vessel does not break out before that time,

1872. February. "which may occur at any time, as our anchorage does not give us much protection.

"If the journey toward the north should be made by means of a boat, considerable time must elapse before it can be safely begun, and the question arises how to employ that time to the best advantage.

"As the object of the expedition is a geographical one, and as geography consists not merely in laying down a coast-line, as many may think, but requires much more than that; a sledge-party should be formed, provisioned for twenty days, to penetrate into the interior of the country, to discover if it consists of an ice-plateau, as is supposed by some, but which does not seem probable, or, in a word, to investigate its configuration. This would also give an opportunity for answering some important questions contained in the instructions.

"Another party could, at the same time, go to Cape Constitution, to determine astronomically the position of Morton's farthest point, which, in regard to longitude, ought to be verified. Besides that, these points of the coast-line should be connected with the survey of our anchorage.

"Regarding the matter of verifying positions, it will also be very desirable to send a party to Grinnell Land, the coast-line of which, although changed a good deal by Dr. Hayes, does not seem to be correct, and ought to be

"resurveyed. Besides that the party could, perhaps, find out if the land contained any glaciers, as Dr. Hayes stated. **1872. February.**

"There is no doubt that it would be considered as a very valuable geographical discovery to determine how far Grinnell Land extends from east to west, which might be done by ascending some of the high mountains near its coast. It must be confessed that this party would be subject to many difficulties and much risk, even if open water did not impede their progress, because the ice is rough and hummocky, and liable at any moment to go adrift.

"(As matters stand since the day before yesterday, it would be impossible to cross the strait. February 21, 1872.)

"It is not impossible that the ice in the southern part of the straits will be better for traveling purposes, so that the Cape Constitution party might cross with comparatively little difficulty; but if you take into consideration how much trouble it cost Dr. Hayes who crossed the strait twice, how it enervated his party, it seems better to give up this plan, especially because next summer there would be very likely a more convenient way of reaching Grinnell Land.

"As it has been concerted, the Polaris will leave at her anchorage a depot of provisions and a boat. Should

1872. February. "the vessel be compelled to leave her anchorage before the sledge parties return, then the party arriving first at Polaris Bay should wait for the other, and upon its arrival proceed to Newman's Bay (the only harbor we know of toward the north), in the most expeditious manner. By all means it would be a good plan, if the vessel breaks out before the return of the sledge parties, to leave also a boat with a patent log and provisions at Newman's Bay, because the boat left at Polaris Bay would be used to carry the united sledge parties, and there should be another to fall back upon, in case of accident.

"If the vessel should drift south during the absence of the parties, then documents of the further route they intend to take will be found a few feet to the west of the present site of the observatory. The spot may be known by the iron bar which now holds the pendulum-case.

"Let us return, after this digression, to consider a plan for the operations of a boat party toward the north. One of the smaller boats should be taken, with as many provisions as possible, the necessary instruments, and small stores. The party should follow up the eastern side of the strait, surveying the land and making such investigations in hydrography, in regard to currents, sea-atmosphere, and soundings, as may be made without too much delay.

"As near each full degree of latitude as possible the party will build a cairn, and deposit a record of its proceedings, in order that the vessel, if necessary, may know where to search for it. 1872. February.

"Should we, notwithstanding the favorable prospect we now have, be compelled to use sledges on the journey toward the north, then we should start as soon as possible, by all means by the middle of March, because it is not probable that then the temperature will be much lower than it is now, although we might have more gales.

"It cannot be denied that it is a great advantage to use dogs for draught, provided sufficient game can be procured on the way for their food, but as we are compelled to travel over a poor country and make large distances the dogs will prove hinderances rather than help. We must, then, as the English expeditions have done, almost exclusively use men for draught. Two dog-sledges should be taken, loaded with four small sleds, the provisions belonging to them, and besides provisions for the whole party for thirty days. Should the two sledges meet with many difficulties in advancing, which will very likely be the case, then they will establish, at places they may find favorable, small depots of provisions for their return, stay as long as possible with their small sleds, and return when circumstances require it. Then the small sleds will

1872. February. "be loaded with the undiminished provisions, and each man drag his own sled, a total weight of two hundred pounds.

"By no means can the small sleds expect to return by the same way over the ice, because at that time it will be broken up, and the vessel herself under way for a high latitude.

"As has been mentioned in the case of the boat party, the sledge party will also build cairns and deposit records of their proceedings.

"Having arrived on their return at a place from which they are unable to travel any farther south, they will keep up a continued watch and signalize by flags and smoke, while the vessel fires a gun several times a day.

"Now, a few remarks upon the operations of the vessel. It would undoubtedly be best to use as little as possible of our coal, and to proceed north by sail. If it is possible for the vessel to advance along the coast of Grinnell Land it would be profitable to do so, on account of the running survey that could be made, as there certainly will be some one on board who can conduct a work of this kind.

"The determination of the local attraction of the compass before the vessel starts should not be neglected as heretofore, because without this an able survey cannot be made.

"It should be considered as a matter of the highest importance to take deep-sea soundings, or soundings in general, whenever practicable; for, except those made by John Ross in 1818, there are but a few taken by Inglefield and two by Kane. If the time will not allow of more, one sounding a day would be valuable and should be taken. 1872. February.

"If the water is not very deep, one of the smaller dredges should be used to procure a larger number of specimens than can be obtained by the apparatus of Brooks.

"EMIL BESSELS.

"Winter-quarters, latitude 81° 38′ north, longitude 61° 44′ west. February 10, 1872."

It was intended to celebrate Washington's birthday by a dinner, but the gale blew so fiercely that it was impossible to make the galley-stove draw. The meal was cooked upon the small stoves, and each mess had what it chose. In the cabin musk-ox meat and clam-chowder were the favorite dishes. The captain broke open a box of Koesysbacher wine and gave one half dozen bottles to the men forward and the remaining half dozen to the cabin mess.

Early on the 23d, the temperature was below the freezing point of mercury. For two nights in succession two different men, who were making tidal observations,

1872. February. were startled by a strange sound near the observatory. The dogs, which lay near the vessel, were also much excited when they heard it, and ran in that direction, returning after some time looking as if they had given chase to some animal. This aroused some of the men, who, on the 25th, set out on a grand hunt to discover, if possible, the cause of these noises. Another party went to Observatory Bluff to catch a glimpse of the sun, as they were told it would be near enough the horizon to be seen from such a height. So few were left on the ship that no Divine service was held. The hunting parties were as usual unsuccessful. They tramped over miles of the desolate country without seeing any signs of animal life. Low, thick stratus clouds hung about the horizon so that the sun was not seen. Several small cirro-cumulus clouds near the zenith were colored with deep orange and crimson hues, while the tops of the mountains near Lady Franklin Strait were of a yellowish-white color, as if illuminated by the direct rays of the sun.

On the 27th, an unusually low tide, the effect of a strong northeast wind, caused the vessel to heel over in a very uncomfortable position. Without assistance it was impossible to walk across the deck. When the tide rose again the water stood two feet above the ice alongside the ship.

1872. February.

The morning of the 28th, was bright and clear, and there was a promise that the sun would be seen after its absence of one hundred and thirty-two days. At 11 a. m., all hands were out watching the steadily increasing light about the southern horizon. Some were perched on the foretop, and others on the top of Providence Berg, while groups at the observatory and on the floe were eagerly discussing the approaching spectacle. A few small clouds over the tops of the mountains were brilliant with the light of the sun, and were taken by some for the sun itself. At 11.55, a small portion of the sun's upper limb was seen through a gorge in the mountain, but it soon disappeared. At 12.15, the whole orb suddenly appeared from behind Cape Tyson, and rolled in full glory over the southern fiord. Cheer after cheer went up from the joyful company, with ceaseless echoings. The floe seemed alive with young school-boys, out for a short recess. The men leaped and jumped about, and tried in vain to express their full joy. Cries of "O! how warm it is!" "He has not forgotten us," &c., went up on all sides. The carpenter was particularly happy, and went around with a bottle of wine, which he had saved from Washington's birthday, calling upon each one to take a drink with him. The sun continued above the horizon until 2 p. m. At that time, however, it appeared as a red ball hanging over the straits to the southwest. Half

1872. February. a bottle of wine was given to each man, and Dr. Bessels distributed one hundred cigarettes among the men forward.

Joe, who had been out hunting, reported that he had seen in the open water three dovekies. He said they were the young of last year, and that it was well known among the Esquimaux that this species of bird spent their first winter in the Arctic regions.

To the communication presented by Dr. Bessels on the 21st, Captain Budington replied as follows:

"THANK-GOD HARBOR,

"*February* 29, 18'..

"SIR: I have carefully examined the contents of your communication, dated Thank-God Harbor, February 10, 1872; and your suggestions as to an early trip to Cape Constitution and the inland meet with my entire approval. Anything to the furtherance of science which can be done before the starting of the final expedition to the north, in pursuit of the principal object of this expedition, I would decidedly advise you to undertake, and you may be assured that all possible aid on my part shall be given to you and your undertaking. The expedition to the north, will, in all probability, proceed by the aid of boats; and it is my decided intention, in such a case, to take command of the boat party. To come to any conclusion as yet in regard to the details of this boat journey and the

"proceedings of the ship, appears to be useless, inasmuch as circumstances will generally govern our actions. 1872. February.

"Very respectfully, yours,

"S. O. BUDINGTON,

"*Commanding United States Steamer Polaris.*

"To Dr. EMIL BESSELS,

"*Chief of the Scientific Party*

"*of the North Polar Expedition.*"

The carpenter was engaged in putting a window in the roof of the observatory. He could not have selected a more unfavorable time; the wind was blowing with great violence from the northeast, and the usual snow-drift was not wanting. Mr. Bryan, and Mauch, who were on watch at the observatory, worked for two hours to clear the snow out that had drifted in through the hole the carpenter was making for the window. To add to their disappointment, the window was not put in after all, something occurring that rendered the postponement necessary. The wind was blowing so fiercely that the observers determined to remain at the observatory during their entire watch, instead of going to the vessel for their dinner at 3 p. m., as was their custom. They did not, however, remain without something to eat, as Joe brought some dinner over to Mr. Bryan. Joe also brought a letter from Mr. Meyer, stating that Dr. Bessels was suffering so much

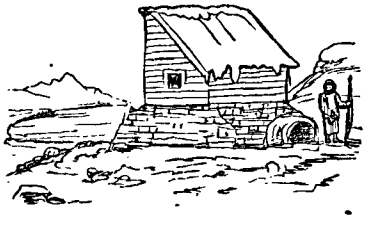
1872. February. with his eyes that he would be unable to take his watch. It was proposed that Mr. Meyer should make the observations from 7 p. m. till 7 a. m. the next morning, and then Bryan and Mauch should come on watch. The snow had drifted so much about the vessel that the bank which was 16 feet distant was 10 feet high and very wide at its base.

The highest temperature recorded during February was —0°.7 F.; the lowest, —43°.5 F.; while the mean was about —21°.3 F. These figures are made up from the regular meteorological journal.

The coal used during the month of February was, in the—

	Pounds.
Forecastle	1,943
Cabin	1,738
Galley	2,487
Observatory	1,492
Total	7,660

This was an increase over the previous month of 398 pounds.



XIV

CHAPTER XIV.

1872. March.

The heavy gale from the N. E. continued during the 1st and 2d, at times attaining a velocity of 50 miles per hour. The wind had blown so fiercely on the night of February 29th, that fears were entertained lest the vessel should get adrift. Captain Budington remained on deck until 1 a. m., anxiously watching for any sign of movement, and all were momentarily expecting the cry of "all hands!"

From this time light winds and fair weather were experienced until the 7th and 8th, when a heavy N. E. gale set in. On the 10th it attained a velocity of 36 miles per hour.

During the 11th the wind was variable. In the afternoon a very remarkable change was observed. It blew from S. E., then E., then N. W., then W., and then settled down to a gale from the N. E., reaching on the 12th a velocity of 50 miles.

After this, light winds and calms prevailed up to the

1872. March. 20th; then again for over two days a very strong gale blew from the N. E., with drifting snow. The anemometer, for eleven consecutive hours, recorded a velocity of 40 miles per hour.

The effect of the wind upon the temperature was very remarkable during the month. Northeast and east winds always lowered it, while southwest and northwest winds raised it. Mercury was frozen during the 2d, and the first part of the 3d. On the 4th, mercury was frozen from midnight until the southwest breezes set in during the afternoon.

On the 6th, during the prevalence of the southwest winds of the early part of the day, snow fell. From 8 a. m. till 1 p. m., a N. W. wind brought thick fog, the thermometer standing at —20°. Then a gale set in from the N. E., which cleared away the fog, brought snow-drift, and lowered the temperature ten degrees. As it increased in violence the mercury fell until finally it was frozen; it continued frozen until 10 p. m. of the 9th. The gale abated on the 8th, but the coldest weather occurred on the 9th. The spirit-thermometer read at one time —53°.9 F.; as it had a correction 5°.4, the true temperature was considered to be —48°.5 F. This was the lowest observed by the expedition.

The wind varied in direction and force in places quite near each other. On the 13th, a party at Cape Lupton

experienced a very strong S. W. gale, while it was perfectly calm at the ship. On the 23d, a heavy snow-drift was seen moving rapidly down the straits under the force of a strong northeast wind, while near the vessel only light airs were stirring. 1872. March.

On the 3d, the solar radiation thermometers were placed in position. On the 15th, the black bulb in vacuo read at noon +26°, while the snow on the ship's side was melting. On the 24th, the black bulb in vacuo read +51°.9, the one free +0°.4, while the temperature of the air was —14°.4.

The gales of wind were sufficiently frequent and strong to keep the ice in constant motion. A southwest gale covered the straits with the rough pack, while northeasterly winds cleared the ice out, and left large expanses of open water reaching sometimes quite near the ship.

On the 12th, the wind was so strong that it was impossible to keep any fire in the galley-stove. Whenever fire was kindled the smoke was blown down the pipe, and filled the passage-way, making it impossible for the cook to do his work. This trouble was caused by N. E. gales, and it seemed impossible to remedy it. The same day, stones as large as an egg were found on the ice twenty paces from the shore, where they had been transported by the wind. On account of the continued motion of the Polaris, the cradle of ice in which she lay constantly

1872. March. increased in thickness by additions to its surface. Thus the ship was lifted up bodily, so that on the 1st, the 6-foot mark was visible above the ice; the bow was lifted more than the stern. The higher she was lifted the greater was her inclination at low tide. It was found necessary to fasten cleats fore and aft upon the cabin and on other decks. In the lower cabin, the officers were compelled to stand at their meals, and even that was attended with difficulty. During all this time the strain on the vessel was very great, causing the timbers to complain. The sounds were so loud that the people were kept awake notwithstanding their familiarity with them. The result of this was that the ship was very severely strained; even the beam ends, and joints of the frame, opened.

On the 26th, the engineers discovered that the whole engine had shifted bodily about three inches toward the port side of the vessel.

The light increased rapidly. On the 1st, the window in the observatory was found useful, no artificial light being needed for six hours. The weather was almost always more or less cloudy.

Mauch mentions in his journal that on examination of the meteorological record he found that there had only been one day, the 25th of November, during which there were no clouds. The proverbial clear sky of the

Arctic regions was not seen, owing, perhaps, to the proximity of open water. The cloudy weather caused the greatest inconvenience to Mr. Bryan in his transit-work. The object of that work was to obtain as many moon-culminations as possible. When it is stated that, during four lunations, twelve series of observations only were secured, some idea of the amount of cloudy weather can be formed. 1872. March.

On the 10th, twilight was more brilliant at midnight than it had been at noon during the month of December.

Captain Budington, in his journal of the 13th, says: "At 8.15 a. m., as the sun was just coming up from behind the mountains in the southeast, we noticed one of the most beautiful phenomena. The glorious orb, unrivaled in its magnificence, exhibited an imperfect halo of about 22° radius. The sky was clear, and the lower atmosphere somewhat misty. Both sides of the halo exhibited very distinct spectrum colors. They seemed to rest upon the ground. The one to the left-hand side had for its base the plain, and as background the hills that surround our harbor toward the east, not more than two miles distant; the other rested on the side near the beach. The red color in the spectrum was inside, and the other colors followed in their usual succession. The phenomenon continued the entire morning. At 1 p. m., the halo seemed to be more perfect, and the upper part was more illuminated.

1872. March. "At the same time minute ice-crystals began to fall. The sky then cleared up entirely, and the atmosphere became extremely pure. During the rest of the day, the sun shone very brightly until 5 p. m. It has been undoubtedly the most beautiful day that we have spent in the Arctic regions since making winter-quarters. It compensates us materially for the dreary tediousness of the winter. For several successive hours an entire calm existed. The temperature, compared with that of a few days ago, was pretty high, ranging about —21° F. The opposite coast was clearly visible, and the straits were again partially covered with new ice. Most of the men were out enjoying themselves on the ice; some, however, preferred a long tramp to the north, a direction which seems to be a favorite one with them."

The main-deck awning was taken off on the 15th, to give light to the cabin. Its removal had been delayed in order to allow Dr. Bessels to take a photograph of the ship in her winter rig. A very good negative was obtained from a position near the observatory. Dr. Bessels then took it to the ship and washed it, but it was a fatal operation, as the whole picture peeled off. He attributed the accident to the freezing of the film while carrying the negative to the vessel.

On the 18th, the quarter-deck awning and the forecastle awning were removed. The binnacles were re-

placed in the pilot-house. When all this had been done the men took the little howitzer upon the ice, where they amused themselves by firing balls at an iceberg. 1872. March.

On the 24th, the twilight was so bright that common print could be read at midnight. The effect of the light and heat was observable in the vegetable growth, for on the 13th Mr. Schumann brought to the observatory a sprig of *Salix arctica*, the buds of which were almost bursting.

The Esquimaux were repaid for their labors in hunting by an occasional sight of seals, and on the 18th, Hans shot an ook-gook; he was not, however, able to secure it.

Captain Budington, in his journal of the 23d, says: "Hans, who has been out to the open water in pursuit of seals, returned towards noon, reporting that he had obtained one of the animals. He took a sled and a team of dogs with which to transport it to the ship, and soon came back with his trophy, which, to our greatest surprise, proved to be a *Phoca fœtida*, a very rare species. Its skin is of a dark grayish-black color, and entirely covered with white concentric rings. The doctor prepared the seal for the Smithsonian Institution. Upon dissection it was found to contain a fœtus, weighing seven and a half pounds, and covered with hair of a silver-gray color. Hans deserves much credit for his perseverance in catching the seal. Watching at a hole made in new ice of

1872. March. "about three inches thickness, he at last caught sight of the animal, and fired at it. The water, however, swept it under the ice, and he was compelled to take off his coat, and with his arm reaching into the water, he felt with the spear all around under the ice where the seal might have floated to. Three holes he was forced to make in the ice before he found the animal and properly secured it. Nobody, I believe, was happier to-day than Hans, for during the past four weeks it was rather hard for him to go out hunting daily, and return disappointed."

The next day Hans shot another seal, and came to the ship to procure a sled. He carried also his kyak out to the open water to aid him in obtaining it, but before he reached the place of attack the animal had disappeared.

On the 8th, the Esquimaux hunting on the land saw a rabbit, or Arctic hare. The next day many small tracks were found on the snow, which, after considerable discussion, were pronounced to be those of a little Arctic animal called the "lemming." This occasioned considerable surprise, since the lemming was not known to exist on the western coast of Greenland. On the 14th, Dr. Bessels reported that he had seen a snow-bird in the ravine back of the observatory.

On the 16th, Messrs. Chester and Bryan, while taking a walk on the ice, saw a gull flying toward the north.

On the 22d, William Nindemann and Gustavus Lin-

quist went to examine a steel-trap set by them a few days before. They were much gratified to find that the leg of a very fine white fox was firmly held by the trap. The poor animal had frozen to death. They offered it, as they did everything they obtained, to Dr. Bessels for a specimen; but on account of the condition of the leg he was obliged to decline it. 1872. March.

Many attempts had been made to obtain some animal life from the water through the tide-hole, but they had been unsuccessful, if the shrimps be excepted with which the water was fairly alive. Some of the seamen proposed attempting to use them as food. They lowered a piece of pork into the fire-hole, and after a few moments they pulled it up, covered with the little creatures, of which the largest were not more than an inch and a half long; they varied in length some being almost too small to be seen.

The water was seventy-two feet deep, and seemed to be alive with them. In a little while the seamen obtained a large pot-full. They were cooked for lunch, but, perhaps for want of skill, they did not make a palatable dish.

On the 24th, two of the men reported that they had seen two white gulls. On the 25th, Captain Budington, while taking a walk to Cape Lupton for the purpose of examining the ice, saw two ptarmigans, which he supposed were the birds seen the day before by the men and

1872. March. mistaken for gulls. The same morning Robert Kruger and Fred. Aunting reported seeing two ptarmigans on an iceberg and firing at one without success. It was concluded that they were the same birds that had been seen by Captain Budington.

On the 24th, one of the men, in a tramp over the land, found, among some moss on a stone, two caterpillars, which he brought to Dr. Bessels for his collection.

Mauch's journal of the 3d says: "To-day I have to announce a sad loss. Our yellow Esquimaux bitch 'Smarty' is no more. The poor animal had young ones yesterday, some of which were devoured by the other dogs as soon as they were born. About 9 a. m., one of the men found the dog on deck and other dogs tearing her to peices, and swallowing her partly alive. He chased the dogs all outside, and gave 'Smarty' a nice place in a corner, where she soon was stiff. Indeed, the voraciousness of these Esquimaux dogs is beyond all limit. Not satisfied with her young ones, they tried to eat her up, too, just because the poor animal in her weakness could not defend herself. We can soon tell what good these dogs will do us."

On the 6th, there were twenty-five dogs in fine condition for sledge travel. Many of the others also could be used, so that there were enough to equip two or three parties for explorations overland. On the 12th, and for

a few days previous, several of the dogs were troubled with fits. 1872. March.

The fire-hole had been encroached upon so much by snow-drifts and by the accumulation of ice around it —hourly removed from its surface to keep it open—that the labor of the tidal observers was very much increased. A new fire-hole was cut on the 4th, about eighty feet from the vessel, clear of the snow-drift. The thickness of the ice was found to be 4 feet and 1 inch.

Dr. Bessels suffered at times considerably from his eyes, so that he was unable to take his regular watch at the observatory. He had already begun to prepare for one of the sledge-journeys which he contemplated making before it was time to use the boats. It was conceded that, if possible, the boats should be used for northern exploration. The men were more familiar with boats, more could be carried in them, and under favorable circumstances a longer journey could be made. The open water seen during the winter was encouraging, and led to the expectation that when summer began the straits would be sufficiently free to admit of boat-navigation. Captain Budington proposed to do his utmost to attain a high latitude in boats. It was, however, very well understood that they could hardly be expected to start before June. In the mean time there was the sledding season of nearly three months for that kind of work, by which the success

1872. March. of the English Franklin Relief Expeditions was attained. Dr. Bessels, to whom the direction of sledge-journeys, in the event of Hall's death, was expressly given by Mr. Robeson, exerted himself to employ this means to the best advantage. In his plan of operations he proposed to fit out at least three parties. All were very much rejoiced at this exhibition of zeal and activity. On the 22d, he was prevented from starting by the threatening indications of the barometer.

Mauch's journal of the 8th says: "I saw for the first time to-day frozen kerosene oil. The crew were digging out a barrel on shore from under the snow, and they tapped it on the spot. I immediately concluded, being just in the mood to make some experiments, to determine the freezing-point of kerosene oil. I filled the basin which stands in the observatory with the oil, introduced one of our best spirit-thermometers into it, and watched the temperature until the oil began to coagulate or get solid. This point I found to be —32°.5 F. I exposed it still longer, expecting to be able to get a hard cake, but in vain; the temperature fell as low as —44° during the time. The consistency of the oil, when thus frozen, may be compared with melting wax. It has a milk-like, translucent color, and retains impressions with the finger very easily. It seems not to crystalize, for I was not able to detect any crystal in it, even under a microscope."

1872. March.

During one of his hunting expeditions, Joe rode down to the southward and westward, and saw what was supposed to be a large bay, to which was afterward given the name of "Petermann's Fiord."

The 16th was a beautiful day; all hands enjoyed it. On the ice near the ship the four Esquimaux children were playing very happily. Mr. Meyer was at Cape Lupton surveying; Mr. Schumann was on the ice sketching the vessel; Mr. Odell was engaged in repairing the snow steps that led up to the gangway—building marble steps, as he called them; and Fred. Aunting was flying what he called a North Pole kite, with a small flag attached.

On the 17th, Jamka and Nindermann found upon Offley Island some very valuable fossils. They were the only vegetable fossils that had been discovered by the expedition, and were very fine specimens. They looked like petrified pieces of sugar-cane or bamboo. All the specimens that were collected, upon their return to the vessel, were at once given to Dr. Bessels for preservation. As the days lengthened, the people took more exercise, and the time between meals began to seem long. To remedy this, on the 20th, the three meals were restored, and the hours prescribed were, 7.30 a. m., 11.30 a. m., 5.30 p. m.

During part of the 20th, the men were employed in making small canvas bags for use on the boat journey. It is unnecessary to enter into the details of the many ex-

1872. March. cursion parties; none of them were without interest, but nothing new was discovered.

At 7 a. m. of the 27th, Dr. Bessels, accompanied by Mr. Bryan and Joe, with a team of fourteen dogs, equipped and provisioned for fourteen days, set out on a sledge journey to Cape Constitution to connect Kane's survey with Thank-God Harbor. At 1 p. m., a message was received from them saying that they had forgotten the India-rubber camp-blankets, and requesting that they be sent. This was written on a piece of wood and sent by a dog, who carried it on his neck. It was brought to Captain Budington by one of the men on the dog's arrival. The blankets were sent by Hans and another man, who found the party occupying a snow-house on Offley Island.

The Arctic day was so far advanced that no artificial light was needed in the cabin, even at midnight.

On the 29th, the fog was so thick that the observatory could not be seen from the ship. The thermometer was —13°, and many ice-crystals were deposited.

On the 30th, Peter Johnson saw a hare on the plain east of the observatory. The men were eager to kill it, and at 4 a. m. of the 31st, one of them started in pursuit, returning with it at breakfast-time. He had found the tracks in the fresh snow, and was soon able to overtake it. The hare was not afraid, but stood on its hind legs and

looked at its enemy with curiosity. In the course of the forenoon the men brought to the ship eight ptarmigans, killed on the plain southeast of the observatory. **1872. March.**

The highest temperature during the month was +4°; the lowest, —48°.5; while the mean was about —23°.2.

The coal used during the month was 7,891 pounds, distributed as follows:

	Pounds.
Cabin	1,892
Forecastle	1,973
Galley	2,665
Observatory	1,361

This was an increase of 291 pounds over the amount consumed during the month of February.

XV.

CHAPTER XV.

1872. April.

On the 1st of April, Captain Budington began to make arrangements for his share of the spring work. He decided that he would send out two boats as soon as the condition of the ice rendered it advisable, and had the two smaller whale-boats brought from the shore, and placed on the ice near the ship, that they might be thoroughly fitted out. He appointed Mr. Chester to command one, and Captain Tyson the other, and they were directed to select their boats and crews.

The crew of boat No. 1, named by the commanding officer the "U. S. Grant," comprised:

Mr. H. C. Chester, first mate, commanding.

Mr. Frederick Meyer, scientist.

Hermann Siemens.

Robert Kruger.

Frederick Aunting.

Frederick Jamka.

Boat No. 2, named the "George M. Robeson:"

Capt. George E. Tyson, assistant navigator, commanding.

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Dr. Emil Bessels, scientist.
Gustavus Linquist.
Henry Hobby.
Peter Johnson.
William Nindemann.

The commanders were ordered to have their boats and crew in readiness to start the 1st of May.

At 2 p. m., Mr. Bryan and Joe started to rejoin Dr. Bessels, whom they had left on Offley Island, with a sled which they had brought back to be repaired. Hans, with another sled, accompanied them, on the complaint of Joe that the work was too hard for him. In the afternoon two ptarmigans were caught; a wolf also was seen. On the 2d, canvas covers were made for the boats. Mr. Chester superintended the work, and by his direction provision-lockers were built, and boards added, extending the height of the gunwale six inches. The continued increase in the sunlight was still noticeable. At this time, the sun's rays were illuminating the mountain peaks at 3 a. m.

At 8.30 p. m., his center was slowly moving over the tops of the mountains in Grinnell Land; at 9.30, his upper limb could still be seen through one of the gorges. Soon the sun would be entirely above the horizon for the whole twenty-four hours.

On the 3d, the solar radiation black-bulb thermometer *in vacuo* read, when at its highest + 59°.7, the

free bulb + 50°, while the temperature of the air was —10°.4. 1872. April.

On the 4th, Mr. Chester fastened on the stern of his boat a large reel, upon which was carried 2,500 fathoms of sounding-line. The seamen had measured the line, and the reel was arranged for the work of taking soundings. Mr. Odell and the firemen were employed in making iron bolts and braces for use in the boats.

Mauch's journal of the 7th, says: "I have visited the ravine east of the observatory, distant about two miles, and shall never regret the time I spent there. The sight which I enjoyed was beyond my expectations. A narrow gorge leads into it, on each side of which the slaty overhanging layers of Devonic limestone, much broken and cliffy, give it the aspect of the ruins of some of those old castles that I saw on my trip down the Rhine. But far more grand and magnificent it gets the farther we proceed. I meet with a large snow-wall at least one hundred feet high, perfectly perpendicular, except on the top, where it seems inclined to tumble over and bury a person that gets too near; but, to proceed further, I must pass the dangerous spot. Here is a ravine leading out. I try to ascend it with hands and feet, using my knife to cut steps whenever I get on hard snow. I nearly reach the top, when I find an obstacle in my way in the shape of a bowlder, which is jammed between the rocks and makes a fur-

1872. April. "ther attempt impossible. I am compelled to return by the same dangerous route, and conclude to follow the ravine to its end, where, as I know from others that have visited the place before, an ascent is possible. At last I am before a snow-wall which appears to be the end of the ravine, and by cutting steps into it with my knife, as I have done before, I find myself on top of the hills. From there I conclude to return immediately on board."

At 11.30 a. m. on the 8th, Dr. Bessels and his party returned to the ship from their sledge-journey. They were all in good health and spirits, with the exception of the Doctor, who was suffering from snow-blindness. The following brief account of the journey is taken chiefly from Captain Budington's journal.

The course at first was nearly south. At 11.30 a. m. of the 27th of March, a fog gathered about them and a light snow began to fall. The view was very limited, and they soon found themselves lost among the hummocks. The traveling was slow and laborious. The dogs continually needed assistance; the sled being heavily loaded, the work was by no means easy. At 1.15 p. m., the coast was reached. The fog and thick snow-storm still filled the air, and nothing definite in regard to their position could be determined. After some discussion Joe's view was adopted, that they should move down the coast toward the southwest. At 4.30 p. m., after much labor on account of the rough ice, the southern fiord was

reached. On arriving at the southwestern end of Offley Island they resolved to encamp. Joe found a deep bank of snow, which, by piercing it with his spear, he proved to be sufficiently hard to use in the construction of a house. With his long-handled snow-knife he cut several blocks of about the same size. They were from two to three feet in length, about eighteen inches wide, and six inches thick. The larger surfaces of the blocks were slightly curved to suit the form of the igloo. When nearly enough blocks were cut, he marked out a circle within which he cut out other blocks, by means of which the floor was lowered the thickness of one block below the general surface of the snow. The widest one he reserved until he closed up the first layer, and then used it to begin his spiral. Each block was firmly placed and fully supported by bringing the beveled edges into contact with each other. After the first course, the blocks were made to incline inwardly by beveling off the edges upon which they stood. It was soon finished; Joe stood inside of a complete and perfect snow-dome. The final touches were given to it by smoothing off the surface and filling up the cracks. Then Joe selected a place for the entrance, and still further sunk the floor by a space 2 feet wide, 18 inches deep, and about 3 feet long from the edge of the wall back toward the center. When this floor was completed, a hole was cut through the wall for a door.

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1872. March. When the house is built on a deep snow bank, the wall is sometimes not touched, as an entrance can be dug out of the snow under it. Then an arched way is built outside to protect the entrance from the wind. A small house is built near by in which to store the articles of food that are not immediately wanted.

The process of moving into the house commenced. First the rubber blankets were spread over the floor, and upon them were laid the sleeping-bags and extra clothing. The provisions were stored on each side the entrance, and the Esquimaux lamp placed in position. While this was going on, the dogs were fed and Dr. Bessels prepared the supper, which, when the house was finished and furnished, all went in to eat. Joe fitted a large snow-block into the door, and cut a small hole near the top of the house for ventilation. The whole party then crawled into their sleeping-bags, and lying with their heads to the entrance were soon asleep. They lay eighteen inches below the surface of the snow, protected from the coldest winds. Joe lighted the lamp and placed the wet stockings and mittens on a frame stretched over it. But the lamp was not large enough to dry all the articles, and many were placed under the sleepers to receive the warmth of their bodies, which protected the clothing from being frozen.

Under these circumstances the temperature soon rises to +35° F., and then every one is comfortable.

Early on the 28th, the party walked over the island, examining and surveying it. From the summit Cape Lupton could be seen, and it also could be perceived that by the projection of Cape Tyson, Offley Island had appeared from Cape Lupton to be a peninsula. 1872. March.

Leaving some of the provisions in the snow-house, at fifteen minutes past noon, they started up the fiord, the ice of which was at first smooth and suited for rapid traveling. The cause of the wide track in it, running up the fiord as far as the eye could reach, was the subject of much speculation. Its edge was bordered by large hummocks, and the whole did not seem to be the work of more than one season. The land from Cape Mary Cleland is low and extends eastward, forming a bay. The course of the party was directed toward the cape at the other extremity of this bay. An immense ook-gook was seen lying on the ice near the crack. The dogs seeing the animal, and being eager to rush at it, were with difficulty kept quiet. Joe went carefully forward with his rifle, but before he could get within shooting-distance, the beast became alarmed and rolled into the water.

A long line of cliffs was found to begin from the second cape, forming, for a great distance, a perpendicular wall of limestone, which enters directly into the water without any *débris* at its foot. On the northern side this line of cliffs is somewhat broken, far in the distance, by glacier

1872. March. discharges, while on the southern side of the fiord the cliffs are neither so steep nor so regular; the glacier resting on them can be seen. One feature, however, is common to both sides. This is a peculiarly marked and well-defined stratum which is seen to rise above the ice, and can be traced by the eye to a great distance toward the southeast, where it ascends to the top of the cliff. The southern cliffs present a similar formation. After rounding the second cape the traveling was very good, except where patches of deep snow and difficult cracks were encountered. Here the experience of Joe was brought into use, and a great deal of time was saved by his judicious selection of crossings. At 2.30 p. m., it appeared that the fiord was shut up by immense icebergs; on going nearer, however, a passage was discovered quite close to the cliff. At 4.45 p. m., coming to a crack which could not be crossed, and where the bergs closing up prevented further traveling by the sled, the party encamped. They built a snow-house and passed the night very comfortably.

Early on the 29th, a ptarmigan halted in its flight on the ice near by them, but not long enough for the hunters to get their guns loaded. Dr. Bessels and Joe started on foot to ascertain if there was any possibility of proceeding in the sled farther up the fiord. With great difficulty they crossed the crack, and then walked a short distance along the cliffs. Their progress was, however, soon ar-

rested by bergs. They climed the highest to examine the condition of the ice. As far as they could see there was a confused accumulation of bergs, crowded closely together, leaving such spaces only as were due to irregularities of form. The fiord seemed filled from shore to shore with these bergs, which varied in shape and size, but not much in height. The termination of the fiord was not visible; its general direction was southeast. **1872. March.**

Dr. Bessels, on his return, tried to take a sounding in the crack near the encampment; all the line was run out—90 fathoms—without finding bottom. Mr. Bryan, during the day, was engaged in determining the position of the encampment, in making observations for declination and dip, and in taking the necessary bearings and angles for the correct delineation of the coast-lines. The latitude observed was 81° 05′ N. With the small Casella theodolite the height of the cliffs was found to be six hundred feet. A very prominent turret was selected, and not only its height, but its distance and bearing from the camp determined. The peak, from its shape and form was named the Devil's Thumb, after the large island in Melville Bay which bears that name.

On the 30th, a heavy snow-storm and a thick fog prevented the party from returning to Offley Island. It cleared up, however, during the morning, and at 1 p. m. they set out. They soon came to a crack which seemed

1872. March. much wider than that which they crossed on their outward trip, and they were delayed some time before a suitable place for crossing could be found. Joe went ahead, and, finding a place, made a signal for the others to come on. The dogs were going very nicely and needed no urging, but Mr. Bryan, wishing to practice with the whip, struck at them. Instead of hitting the dogs, however, he swung the end of the long lash around and hit Dr. Bessels a violent blow on the face, which caused great pain and called forth some remarks of a significant character; but the doctor's equanimity was soon restored, and it was mutually agreed that whip-practice should be deferred to a more fitting occasion.

Arriving at their encampment on Offley Island at 5.30 p. m., they found that their snow-house had bent in so much by the warm weather that they were obliged to take off the top and rebuild it.

Early on the morning of the 31st, they were up preparing to start toward the south. The sled was loaded near the house, and in its passage, over the rough ice down to the smooth ice of the fiord, it broke. Joe declared that it could not be mended, and that he would be obliged to return to the ship after another; accordingly it was unloaded and temporarily patched up for the trip. Dr. Bessels concluded to stay on the island to make geological observations and collect mineralogical specimens. One of

the dogs was left as a companion for him, and Mr. Bryan and Joe returned to the ship. It afterwards appeared that Joe broke the sled on purpose, by letting it fall, while heavily laden, on the point of one of the runners. When the doctor had first spoken to him about this excursion, Joe proposed to take two sleds, Hans driving one; complaining that it would be too hard for him to do all the work. Dr. Bessels did not think so, and wishing to carry as few provisions as possible, decided to have but one sled. Joe apparently agreed to it, but on the first opportunity made an excuse to return to the ship. When he arrived there, he told Captain Budington that he must have Hans and another sled; that he could not manage one so heavily loaded. **1872. April.**

Captain Budington accordingly sent Hans; and the party, now consisting of Mr. Bryan, Joe, and Hans, reached the island at 7.45 p. m., April 1st. They found the doctor well and in good spirits, having met with no trouble during his solitary sojourn. Those who were on board were loud in their praise of the doctor's bravery in being willing to remain alone so far from the ship, even for that short time.

On the 2d, at 7.45 a. m., the whole party started toward the south. They rounded the southeastern extremity of Offley Island and crossed the mouth of the fiord. The traveling proved to be very good indeed, with

1872. April. only occasional cracks and rough ice, and at 11.30 a. m., they reached the other side of the fiord. A bay extends from the cape, at the southern entrance of the fiord, to the cape at the northeast entrance of Kennedy Channel. They steered across this bay, making a direct course from cape to cape. Both capes are quite high, while the intervening land rises gradually in terraces, being very low near the coast and rising to an equal height with the capes some miles in the interior.

They reached Cape Morton at 3 p. m. Joe Island bears about west from this cape. Upon rounding it they found the tracks of a bear. The ice was very rough, a large portion of it being young ice, with many cracks. They saw here the first signs of an ice-foot since leaving the ship. The land now turned toward the east, and a fiord was seen extending inland, on the other side of which was an island lying under a very large and bold headland. This was thought by them to be Cape Constitution, the object of their journey. They then directed their course toward Hannah Island. The traveling was very bad; they were obliged to use the greatest discretion in selecting their route. The ice-foot was the safest, but frequently they found it so completely blocked up that they were compelled to seek the more insecure ice of the straits. This was frequently young ice, hardly able to bear the weight of the loaded sled; at times they escaped breaking

through only by dashing over the thin places. Lifting the sleds up and down from the ice-foot and over the rough hummocks was not an easy task; all became very weary. While striking across the fiord several bear-tracks and innumerable fox-tracks were seen, in such succession that foxes seemed to be following the bears as constant companions. After great labor and not a little danger the island was reached at 8.30 p. m., and an encampment made on its western side. **1872. April.**

On the 3d, the natives, very weary with their labors of the previous day, were allowed to go off to the open water to hunt seals. Several were killed, but only one was secured. Mr. Bryan occupied the day in taking observations. The latitude observed was 81° 07′. Dr. Bessels attempted to make a trip up the fiord, but the dogs refused to go and proved to be the masters. The next day Joe drove the dogs, and, at 7.30 a. m., they started up the fiord, into which several arms of a glacier emptied. Its head was about twelve miles from the encampment. On their return they met a bear, which Joe killed after an exciting and interesting hunt. They arrived at the encampment at midnight. Hans had been hunting all day.

Cape Bryan was found to be twelve hundred feet high. The party supposed from its latitude that it was the Cape Constitution of Kane, which was only known by the description of Morton as having perpendicular sides

1872. April. and being flanked by two islands. Joe and Hannah Islands, though not exactly answering the description of Franklin and Crozier Islands, were at first thought to be the same, and it only remained to ascertain if the cape was perpendicular. As it did not look so from the island, it was determined to test it by personal examination. Accordingly on the 5th, at 5 p. m., Dr. Bessels, Mr. Bryan, and Hans set out for the cape. The ice-foot was so blocked up with hummocks that it was impossible to travel over it with the sled. Having secured the dogs, they left the sled and rounded the cape on foot. It did not correspond in any particular with the description of Cape Constitution. In the distance another cape was seen, which entered the water perpendicularly. They undertook to go to this cape with the sled, but after a severe struggle they were obliged to stop when within a few miles of it. Afterwards, arriving there on foot they discovered that it was not Cape Constitution. They were unable to proceed further, on account of the serious obstacles in the way and the want of provisions. Before turning back, however, they identified Cape Constitution and Franklin Island, the former some thirty miles distant. The water was open in Kennedy Channel as far as they could see. They regained the encampment at 3 p. m., after an absence of twenty-two hours, during which they had traveled under great difficulties. On the 6th, just below Cape Bryan, they met

Joe, who had become anxious and was in search of them. Happily he brought with him welcome supplies of provisions. **1872. April.**

At 2 p. m., the next day, the whole party set out on its return to the ship. They reached Offley Island at 2 a. m. of the 8th, where they breakfasted, remaining until 3.45 a. m.

They got on board at 11 a. m., as has been mentioned. Dr. Bessels suffered a great deal with his eyes. He was obliged to keep his bed until the 13th, and was not able to resume his regular watch at the observatory until the 23d. During his absence, Mr. Meyer took his place, making observations each day for sixteen consecutive hours.

On the 11th, the magnetometer showed that the needle was very much disturbed during the appearance of bright parhelia.

The sun, at midnight of the 16th, shone brightly above the mountains. The calm, cool weather during the first part of April closed up the straits. A few gales during the last of the month set the ice again in motion.

John Herron, the steward, was laid up with a swollen foot, suffering considerably. His complaint was at first pronounced to be rheumatism; but, on the 20th, he showed signs of scurvy.

The traces of the little lemming attracted a great deal of attention, and many efforts were made to catch

1872. April. some of them. Traps were set all over the plain, but in vain. On the 17th, Joe and Hans went off to the south-east hunting, but were obliged to return, as the dogs got into such a desperate fight that nothing could be done with them. One of them was so badly injured that it was found necessary to kill it.

The dogs go in pairs, which are inseparable. They often crowd themselves, while running with the sleds, and in the hustling together have, at times, long and severe battles.

On the 20th, another copper cylinder was thrown overboard.

On the 22d, Mr. Bryan with Mauch walked up to the fifth cape, above Cape Lupton. From an elevation of about twelve hundred feet they had a very extensive view. They could see the west land as far as Cape Joseph Henry, which was distant about 80 or 90 miles, with great distinctness; the eastern coast was shut out by Cape Sumner. Open water seemed to extend from shore to shore, and from the third cape northward for about twenty miles. There, a pack filled the straits, which, however, seemed somewhat open toward the western coast. A low cloud extended from north to northeast, but it was so distant and faint that it was impossible to tell whether it was a water-cloud or not.

On the 24th, the men amused themselves with the howitzer.

The Polaris on Providence Berg, April, 1872.

Mr. Meyer determined the distance between the ship and the observatory to be thirteen hundred and seven feet. 1872. April.

On the 25th, Joe and Hans returned from a musk-ox hunt, for which they had left the ship on the 19th. They had killed on the land north of Newman's Bay seven musk-oxen, one rabbit, and two ptarmigans; they brought part of the meat with them; the remainder they cached. In one of the cows they found a fœtus, which they brought to Dr. Bessels. They reported having seen an Arctic owl and another herd of musk-cattle, and had discovered four small islands in the bay.

On the 27th, a party, consisting of Mr. Chester, Fred. Jamka, and the two Esquimaux, started off with two teams for a musk-ox hunt.

The crew had been employed during the month in clearing off the deck of the vessel of all snow and ice, in preparing for the boat's journey, in arranging in a suitable pile the stores and provisions which were to remain on shore, and in transporting others to the ship.

On the 15th, the ice from about the rudder and propeller of the Polaris was cut away so as to expose them partially; everything was in good order. Only three men could work at a time, but as their relief was frequent, they made good progress. The log of the Polaris speaks of the condition as follows:

1872. April. "I think that it will be some trouble to keep the Polaris afloat when she comes down into the water again. Her sides are much open. Her main rail is broken in one place by the heavy pressure of the whole top-work of the vessel listing over so much and for so long a time. No ordinary-built vessel could stand such a wrenching."

On the 30th, the seamen cut some of the ice away between the vessel and the berg for the purpose of preventing her from falling over so much at low tide; but the object was not accomplished. The moderation of the temperature had led to the formation of great icicles; some of them hanging from the berg were as thick as a man's arm.

On the 26th, the black-bulb thermometer *in vacuo* read +83°.4, the free one +17°.8, while the temperature of the air was +4°.8. During this time the sky was clear, and a light wind was blowing from the southeast, with a velocity of three miles an hour.

The highest temperature during April was +16°.7, the lowest —28°.8, and the mean —5°.7.

In compliance with the orders of Captain Budington the boat-parties had prepared everything to start on the 1st of May. The temperature, however, remained too low for their journey.

At 10 p. m. of the 1st of May, Mr. Chester and party returned. They were all well, with the exception of

Mr. Chester and Frederick Jamka, who were suffering from snow-blindness. They had killed two musk-oxen on the extensive plains north of Newman's Bay, and had traveled to the head of the bay, finding a glacier which discharged itself at that point. They had lost one dog, and had been delayed by others which had fits. They brought back a good deal of meat, which was stowed away in the pilot-house. 1872. May.

On the 4th, a strong gale from the northeast prevailed, rising to a velocity of 53 miles per hour; notwithstanding this there was no open water to be seen in the straits. On the 7th, Joe drove Mr. Meyer down to the mountain souths of Polaris Bay, to enable him to complete the survey commenced in the autumn; they started at 4 a. m., and did not return until 7 p. m. During the day some of the hands were out hunting, and brought back one ptarmigan and one hare.

The 8th was the warmest day experienced for some time, and the crew enjoyed it. Captain Tyson and one of the men were out on the plain for a day's hunt. At midnight, for the first time, the sun shone upon the observatory, and the temperature did not fall below zero. Observatory Bluff had for a long time cast its shadow over the building; the shadow had gradually shortened and now could not reach it.

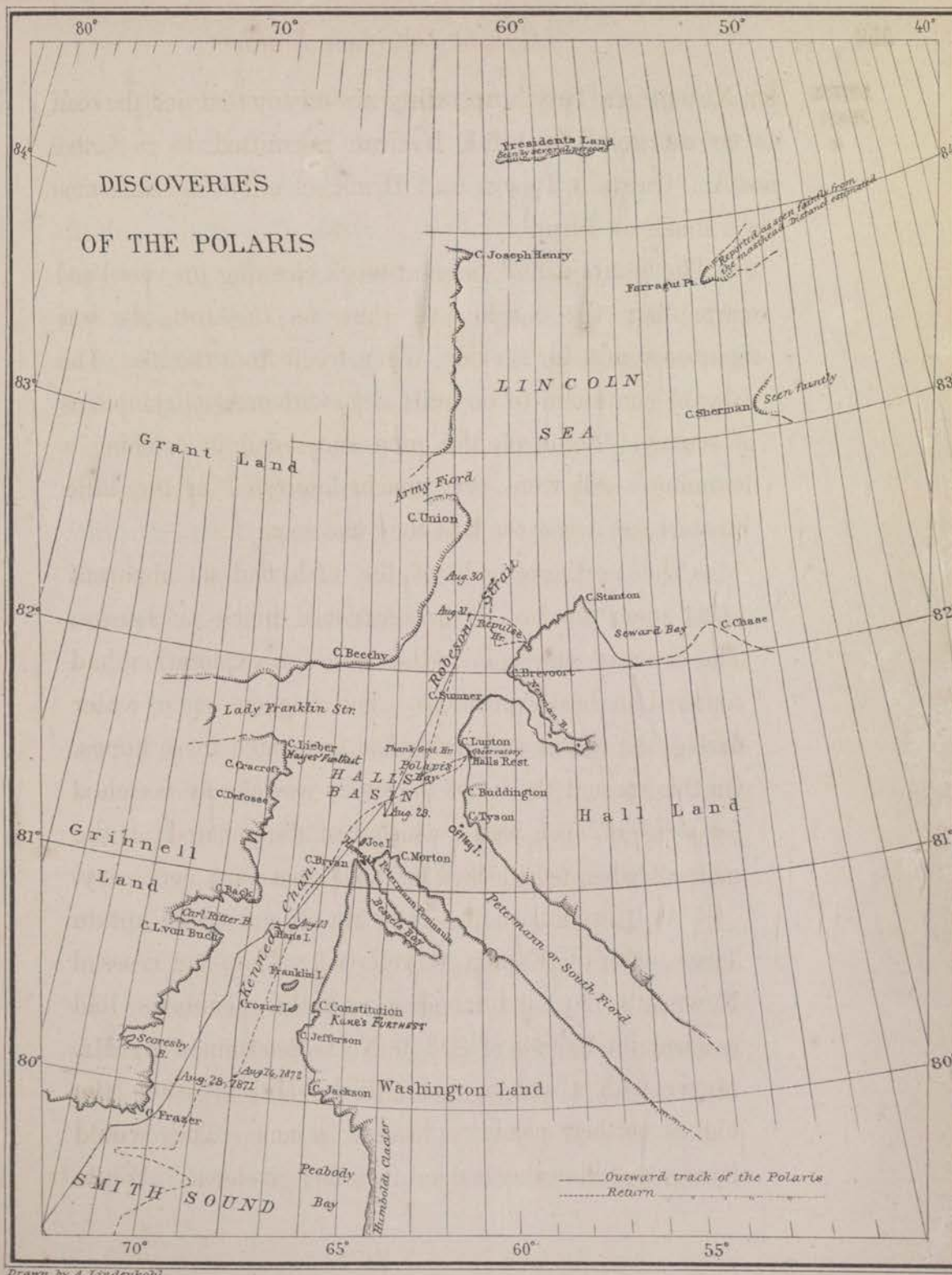
On the 9th, at 4 a. m., Mr. Meyer and Joe started

1872. May. for Newman's Bay, intending to survey that and the coast as far as possible; and, if time permitted, to go further north. Captain Tyson and Hans set out at the same time on a musk-ox hunt.

The seamen had been at work cleaning the vessel and overhauling the rigging, so that, on the 10th, she was reported ready for service, when freed from the ice. The steward continued to be quite sick, with marked symptoms of scurvy. Some of the men succeeded in catching a lemming. All were very much interested in the little creature, as it was the first they had seen.

The northeast gale of the 11th, had no apparent effect upon the ice. This occasioned much uneasiness. The hopes of success in further northern exploration had centered in boat-expeditions. The frequent open water during the winter and spring had warranted these hopes. On this account the ice of the straits was closely watched for signs of open water, which had disappeared at the moment when most looked for, and when most necessary.

At 10 p. m., on the 14th, Mr. Meyer and Captain Tyson, with the Esquimaux, returned. They had crossed Newman's Bay, and traveling over the mountains, had reached the latitude of 82° 09′ N., as determined by Mr. Meyer with a sextant and artificial horizon—then the highest northern point ever reached by land. They would have gone still farther had not their fuel given out. While



Drawn by A. Lindenkohl

Meyer and Joe went to the mouth of the bay to survey, Captain Tyson and Hans crossed it, hunting for musk-cattle, of which they killed twelve, eight large ones and four calves. On the south shore of Newman's Bay, Mr. Meyer deposited a record which had been given him by Captain Budington for that purpose. The weather was so favorable that he was able to sketch the west coast of the strait as far north as Cape Joseph Henry. **1872. May.**

The men had been engaged for two or three days in making beer. It was sour and bitter, but they seemed to relish it, and it was thought that it would do them good. The barrel was placed in the galley, and all were greatly amused at the sign fastened over the door: "North Pole Lager Beer Saloon. No trust. Peter Johnson. Cash."

On the 16th, the ashes which had accumulated during the winter were spread out on the ice near the ship to absorb the sun's rays and hasten the melting of the ice, in order to free the ship as soon as possible. The steward was now improving very rapidly; he ceased to take medicine, and ate much raw meat for his scurvy.

At 10.30 a. m., of the 17th, Hans and Peter Johnson started for Newman's Bay on a hunt, and at 11.30 a. m., Joe and Robert Kruger followed them. From 4 a. m. to 11 p. m., Joe had been with Mr. Meyer, at Cape Lupton, and out on the ice of the straits. Mr. Meyer was engaged in finishing the survey of the surrounding coasts.

1872. May. Too much credit cannot be given to him for the zeal and ability with which he prosecuted the survey of Thank-God Harbor.

On the 18th, three snow-birds were seen. On the 19th, the two hunting-parties returned, having killed two musk-cattle and two ptarmigans. They had seen large numbers of these birds, and could have obtained more if they had been supplied with shot-guns.

Mauch says in his journal: "I have been up to Cape Lupton, comparing Hayes' 'open polar sea' of the 19th May, 1861, with the present one. The straits present a vast body of impenetrable pack, with not a speck of open water."

On the 29th, the steward had so far recovered that he was able to resume his duties. During his illness, Walter Campbell, one of the firemen, had been of great service in doing part of his work.

The rise of the tide, together with the melting of the snow, produced from two to three feet of water on the port side of the vessel. It was necessary to run plank out from the ports to get on board dry-shod. Mr. Chester, having completed his boat, in order to be ready to start as soon as the ice opened, transported her to the little cove just north of Cape Lupton. For this purpose the large sled and a full team of dogs were used; the men keeping company to help over the hummocks.

1872. May.

The 21st was a very warm day; the temperature, for the first time, rising above the freezing point to +33°.6 F. The Esquimaux women improved the sunshine by taking the musk-ox skins to the shore and preparing them for preservation. Mrs. Hans, with her children about her, amused herself in watching a fire built between two stones and the frying of a steak on a thin piece of slaty limestone.

The two natives, with Booth and Hobby, started for Newman's Bay to bring back the meat which had been left there in a cache. In the afternoon a fly was seen. It was much larger than an ordinary house-fly. On the 22d, a northeast gale failed to open the straits; the spirits of the explorers were very much depressed. Dr. Bessels succeeded in catching two flies, which made the beginning of his collection of insects. A snow-bird was seen near the observatory.

On the 23d, the hunters returned, bringing large loads of meat. They had also killed two ptarmigans and had seen one hawk.

On the 24th, water was discovered in the bilge to the depth of three feet; it was feared that the vessel was leaking. Attempts were made to pump it out, but the pumps could not be made to work. The next day the men used the small pump, the 'handy billy,' and freed the ship. The water returned, however, with an increase, but it

1872. May. could not be determined whether it was caused by a leak or by the melting of the ice in the bunkers. On the 27th, the carpenter and Booth were sent below to look for the leak, if one existed. On the 28th, the water had gained five inches during the night; this indicated that the ship was certainly leaking.

To return to the boat-journeys. On the 24th, Captain Tyson's boat was taken to Cape Lupton. On the 25th, the provisions were sledded to the boats. Joe, after one of his loads, instead of returning to the ship, went out into the straits and killed a small seal. The sight of three streaks of clear water in the straits had raised the spirits of officers and men, exciting great expectations; all, however, were cast down, when on the 26th, the straits were again blocked up.

Hannah, in one of her travels, found a very interesting relic, near Cape Lupton. It was quite a large piece of an Esquimaux sled-runner, with one of the cross-bars. It was partially imbedded in the shingle and its position was from four to five hundred yards from the coast, and about fifty feet above water-level. It remained an open question whether it had drifted there or whether it had been left there by some Esquimaux in his wanderings.

Robert Kruger brought to the ship a live lemming, which was put into a box, and carefully fed. On the 27th, in one of their excursions far out in the straits after seals, the natives saw two gulls and several dovekies.

Another live lemming was caught by Robert Kruger, and added to the one in the box. 1872. May.

The lowest temperature during May was —7°.5, the highest + 33°, while the mean was +17°.7.

On the 28th, another boat of provisions was taken to Cape Lupton. "The cracks now in the straits opened with a rising tide, and closed with a falling one."

The sailors began to complain that Mrs. Hans did not keep her apartment clean; being just forward of their quarters, it threatened to become very disagreeable, as the warm weather advanced. Captain Budington examined the room, and was utterly astonished at its state. He had never seen such a filthy place during his long experience among the Esquimaux. He arranged, for the family, a tent on deck, where they would at least have fresh air, and had their room thoroughly cleaned.

Some German sausage had been included among the provisions for the boats; it was, however, decided that it was too salt to be palatable, and it was brought back to the ship.

The two Esquimaux started off on the plain on a hunting-expedition. They were provisioned for several days. At 9 p. m., of the 30th, Robert Kruger and Hermann Siemens, who had been out all day, returned with the intelligence that they had killed a musk-cow. This roused the whole crew, seven of whom at once started for

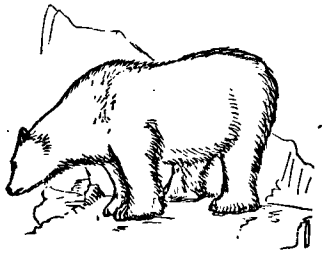
1872. May. the foot of Chester's Mountain. The herd from which one had been killed consisted of four animals; one bull, two cows, and a calf.

Hermann Siemens, in his journal, says: "Suddenly we saw two of these animals, with a calf, resting on the snow at the foot of the mount near one of the ponds about five hundred yards from us. Seeing us they jumped up, when we fired at them. While I was reloading my companion suddenly warned me that a large bull was making at me behind my back, and, looking around, I saw it furiously running against me with all its speed. I quickly retreated until ready with my breech-loader. When I halted, the beast joined the others, and the three formed a line, with the calf behind them, ready for fight, bellowing terribly. We now fired again, but as we did so at a considerable distance, not daring to close in without dogs, only one female fell, and the others, with the calf, took flight. As I had no more balls, and my companion only a shot-gun, we did not follow them."

The party that left the ship soon found the dead cow, and while two of them stopped to skin it the others went in pursuit of the rest of the herd. William Nindemann was the fortunate one, and succeeded in shooting both the bull and the cow. The calf remained near its fallen mother. At 2.30 a. m. of the 31st, some of the men started to return to the ship with the musk-cow, and

three men, William Nindemann, Gust. Linquist, and Henry Hobby, remained to skin the other animals. Notwithstanding that two of the best teams were away, the dogs, which had been hastily collected, pulled remarkably well, and brought the party back in a short time. 1872. May.

At 9.30 a. m., the three men returned, bringing with them the calf. It was alive, but unfortunately one of its legs had been broken by a random ball, and Dr. Bessels killed it to put it out of misery. Nindemann had only wounded the two animals, which were found and killed, but not where he left them stretched out. At 10 a. m., Dr. Bessels went with two of the men to superintend the skinning of the animals, his object being to keep the skin perfect, so that it could be stuffed. They returned at 7.30 p. m., leaving one other load to be brought to the vessel. The meat was placed in the refrigerator in Providence Berg. As the weather became warm it was discovered there was no place about the ship where meat could be kept. A large, square hole was then dug in the berg, and in this ice-chamber it remained sweet and fresh.



XVI

CHAPTER XVI.

1872. June.

The crews for the boat-expedition were ready, and waiting only for a favorable opening in the ice. As both the small whale-boats were assigned for the northern journey, it was necessary for the rest of the crew to have one of the other boats in readiness for use. One of the large whale-boats which had been upon the house, was therefore overhauled and painted, and on the 1st of June hoisted up to the davits.

The men had become rather impatient, and for a change, Captain Budington determined to send them off on a hunt; accordingly, at 1.50 p. m., Mr. Chester's crew started off. At 5.50, they reached the place where one of the musk-oxen, that had been killed a few days before, lay. It was about fourteen miles southeast of the ship. William Nindemann was sent back with the meat, and Hermann Siemens, Robert Kruger, and Fred. Jamka remained and erected their tent.

On the 2d, Joe and Hans returned from their

1872. June. hunt. They had seen no musk-oxen, but had caught two seals in Newman's Bay. On the 3d, three feet of water was again found in the bilge. The deck-pumps being frozen would not work, and it was necessary to get up steam. The little boiler was sufficient, and from noon to midnight kept the pumps going till the water was out. Captain Budington sent Captain Tyson toward the north to report on the state of the ice and the prospects for the success of the boat-parties. Accompanied by Mauch, he started shortly after breakfast, and, after a long and weary tramp, reached the cape just below Sumner Headland. They estimated that they were eighteen miles from the vessel and fifteen hundred feet above the sea-level. After lunching and taking a short nap, they returned to the ship, arriving about midnight. Their report was very unfavorable. The straits were filled with ice. There were a few disconnected leads as far as Newman's Bay, but north of that the pack was close.

Budington says in his journal: "The plain is full of fine streamlets of water that give moisture to the ground. Saxifragas are blooming, and are distributed all over the plain. Insects are getting numerous. Flies and mosquitoes are met with. This single warm day has called many into life."

The log-book at this date says: "It was discovered to-day that the vessel leaked most at high water, and that

"the leak was somewhere near the forward end of the vessel, as the water could be heard in the hold running aft, the vessel being much down by the stern. In the afternoon, after a close inspection outside and around the bow of the vessel, the leak was found. It was on the starboard side of the bow, near the stem, right below the 6-foot mark, the water at low tide being just below it. The heavy pressure, caused by the vessel's hanging over so much above the ice, had bent or cracked the stem and split open a plank, leaving a crack which ran from the stem to about eight feet aft. We went immediately to work to take off the iron sheeting and repair damages, but after an half-hour's work had to stop on account of the turning of the tide, which rapidly rose above the leak. We cannot now tell how badly the stem is damaged." **1872. June.**

The work of stopping the leak went on. The crack was thoroughly calked and leaded over, and the iron sheeting restored to its place. The vessel did not, however, cease to leak. Further search disclosed a corresponding crack on the port side. It appeared that the whole stem was wrenched and split. The seams were opened on each side, and unfortunately, that on the port side was under water at low tide, and could not be closed.

On the morning of the 4th, Captain Tyson's crew started south to take the place of the party in camp, which, on being relieved, returned to the ship. They

1872. June. brought six ptarmigans, the only game they had secured. The Esquimaux who had been hunting all day in the straits caught three seals. They saw twenty-four sunning themselves on the ice, near a crack of considerable length and about three feet in width. A large flock of eider-ducks was seen from the vessel. The ice about the deck-pumps had finally melted away and they were in working order. The steam-pump kept the bilge clear. The temperature rose to +42°, and the effect of the sun was very marked. There was no difficulty in obtaining water. A large hole was cut in the berg, which in a very short time was filled; indeed, the whole side of the berg had become a water-course. A hose was placed in this hole and connected with a hand-pump on deck; from this natural refrigerator one could readily get a bucket or tumbler of the coldest ice-water.

Early on the 5th, Mr. Bryan and Joe set out for the southern fiord. Mr. Bryan wished to complete its survey in which some few important bearings had been omitted. Mauch was again sent to the north to examine the condition of the ice. His report was most discouraging. Not even the disconnected leads seen by Captain Tyson were visible; the whole surface of the straits north, west, and south, was covered.

William Jackson, the cook, had a very severe fall, but fortunately did not break any bones, although he suf-

fered great pain. Wood obtained from old boxes and barrels was now used for fuel instead of coal, which was precious; it was expedient to reserve the coal for steaming. 1872. June.

Hans was off to the south and west hunting, and brought back with him a full-sized ook-gook. He created great excitement by reporting that there was a large body of open water at the entrance to Kennedy Channel. This renewed the hope that something might yet be accomplished by means of boats. The open water into which the ice would be carried by the current and north winds,—leaving an opening above, through which the boats might reach a high latitude,—was expected to be seen first at the south.

In the afternoon, of the 6th, Mr. Bryan and Joe returned, having successfully accomplished their object. The traveling over the ice was quite bad on account of its being generally honey-combed. The feet of the dogs became very sore; it was necessary to protect them with skin-boots to enable them to travel. In many places there was a great deal of water upon the ice, the pools, made by the melting of the snow and ice of the neighboring hummocks, being so deep that it was necessary, when crossing them, to stand upon the sled and hold the instruments to keep them from getting wet. They encamped on Offley Island, and found there an old Esquimaux

1872. June. settlement. Remains of several stone huts were also found, and the ground was streaked with the bleached bones of animals which had constituted the food of the natives. Many pieces of wood and bone which had been used in the manufacture of sleds and hunting-implements were picked up. A large number of the most interesting of these relics, together with many beautiful specimens of fossils, were brought to the ship by Mr. Bryan and given to Dr. Bessels. Some of the same kind of fossils had been brought from Offley Island early in the spring. They were the remains of good-sized tropical trees, and were not found at any other place in the vicinity of Polaris Bay. All the fossils found near Thank-God Harbor had been taken from erratic bowlders, the slaty limestone of the mountains containing no fossils whatever. Offley Island is, however, formed of entirely different rock, and it was in the native stone that these fossils were embedded. Most of them were collected among the *débris* at the foot of a perpendicular ledge which was slowly being disintegrated.

The party had seen numbers of seal and birds, such as dovekies, ducks, and gulls.

While Mr. Bryan was at work on the island, Joe started after some seals. Slowly crawling on the ice, nearly half a mile, imitating a seal, so as not to frighten a watchful ook-gook, he succeeded in getting quite close,

and fired at it. For a while it lay perfectly still. Leaving his recumbent position, he walked toward the animal. It began, however, to move, and Joe fearful lest it should crawl to the crack, threw down his gun, and running up, seized it by one of its hind flippers and pulled it back, just as it was about to drop into the crack. He was not strong, and the beast was large and powerful, so that he could only draw it back a short distance, when his strength gave out. The animal again made for the crack, but Joe returned to the charge before it could plunge. Unfortunately he had left his large knife at the sled; having only a pocket-knife, he used it to the best advantage, but was unable to reach the huge creature's vitals. He continued the struggle until he was completely exhausted, and was then forced to let the animal take the water. He bore about him the marks of the struggle, being spattered with blood from head to foot. 1872. June.

The party had gone some distance into the fiord, and upon their return stopped at the tent to make a call upon the men encamped there. They found all well and in good spirits, but unsuccessful in securing any musk-cattle. Henry Hobby returned with them, bringing five ptarmigans, two different species of snipe, and one snow-bird.

During the afternoon, a beautiful mirage of the western coast was observed. The appearance of the land about Lady Franklin Strait was particularly marked.

1872. June. On the morning of the 7th, Mr. Chester went to Cape Lupton to examine the ice, and soon returned with the report that there was open water near the cape, and that he should start at once. All was excitement and joy. The men were nearly wild with the prospect of doing something. Great expectations were raised that they would now be able to atone for the inactivity of the spring, and add to the usefulness of the expedition.

During the whole winter the boat-journeys had been talked about, and it had been shown over and over again how comparatively easy it was to go to the Pole. No difficulties were allowed to stand in the way, and the route was as clearly marked out as if it were a well-known channel. Undoubtedly the warm glow of the cabin-stove had much to do with the coloring thrown around this boat-journey. So completely had the self-deception been effected, that people now looked with confidence to the result. Hans was sent to the south to bring back the remainder of Captain Tyson's crew, and returned at 6 p. m., with the men, eager to set out for the north. It may well be doubted whether any expedition ever left an Arctic vessel with more confident expectations.

Tidal observations at the ship were now to be omitted, there being no one left to take them. The meteorological record was kept by Mr. Bryan whose

watch extended from midnight until noon, and by Mauch who observed during the remaining twelve hours. 1872. June.

Mr. Chester and his crew set out, under orders from Captain Budington, at 8 p. m. for Cape Lupton, where they found less open water than was counted upon.

On the 8th, Captain Tyson's crew went to Cape Lupton, Captain Tyson and Dr. Bessels remaining at the vessel. One of Tyson's crew brought back a report by no means favorable. Mr. Chester had not been able to get off, and was anxiously waiting for an opening in the ice. The leak of the Polaris seemed to be increasing, and an effort was made to use the donkey-engine and pump to clear the vessel.

On the 9th, at 11 a. m., Mr. Chester arrived at the ship, bearing the unwelcome and unexpected intelligence that his boat was crushed by the ice and was an utter loss. The effect upon the ship's company was indescribable. The grief at the disappointment of their expectations was great, and every one listened with anxiety to the details.

The following is the mate's own statement from the log: "On the morning of the 8th, quite a strip of open water leading up around the cape; launched the boat and loaded up; pulled up about two miles; the pack closing in again, landed on the fast ice; here we stopped about four hours, watching the movements of the ice from the hill. At the end of that time, the tide turning, the ice

1872. June. "began to open again up around the cape near the shore; dragged our boat and provisions over an old floe about one-half mile in extent, and pushed on again. We had proceeded about one mile when the small drifting ice compelled us to land. We pulled up on a level floe between two grounded icebergs, which we considered a safe place to camp. The pack soon set in, and we made arrangements for a short nap before the tide turned again to set the ice off. A good watch was set to observe the movements of the ice, &c., with instructions to call up the crew as soon as the ice opened sufficiently for a passage of our boat up around the cape. At 6 o'clock on the morning of the 9th, the ice began to open again. The mate, who was asleep on a rubber-blanket about one rod ahead of the boat, was called by the man on watch. At that instant the ice broke between him and the boat. Three of the men were with the boat. The piece of ice they were on went off so rapidly that we could not get to them. They soon came in contact with the moving pack, and the boat was crushed to pieces. Everything that was in her was lost, with the exception of three rifles, the box-chronometer, and a few other small articles. The ice soon became still, which enabled the men to get off safely. The pack was moving up the coast to the northwest. A point of an old floe came in contact with the land-ice about a quarter of a mile to the south

"of us, which broke the ice where our boat was, there being at the time quite a space of open water between our boat and the moving pack. Among the articles lost with the boat was the Casella theodolite, which was very much regretted." 1872. June.

A little past noon the crew arrived. They were not at all discouraged, feeling that it was an unavoidable accident. Mr. Chester at once asked and obtained permission to make another attempt in the Heggleman portable folding canvas-boat. His crew set to work to rig it up in the best of spirits, hoping that after all they might accomplish something. Dr. Bessels left the vessel immediately after dinner to join Captain Tyson, who had gone to the cape in the morning. They were to be prepared to start in the evening. Joe, who had been out hunting, shot one seal and two eider-ducks.

On the 10th, a little open water was seen, which encouraged the hope that Captain Tyson had been able to start. Steam was kept up constantly. It was necessary to work the little engine six hours out of the twenty-four to keep the vessel free from water. In the boiler ten pounds of steam was needed when working; at other times only six pounds was maintained.

During the night of the 10th, the temperature fell below the freezing-point, and the pools of water were covered with a thin film of ice. It was noticed that now

1872. June. the winds from the northeast increased the temperature, which fell when winds from the southwest prevailed. This was satisfactorily explained by the reflection that the northeast wind passed over the warm land, while the southwest wind traversed the ice-covered straits.

On the 11th, Hans and one of the men took an advance load to Cape Lupton for Mr. Chester. Upon his return he reported that Captain Tyson and crew had started.

At 10 a. m. of the 12th, Mr. Chester and crew set off in good spirits, with the canvas-boat, singing a song, composed during the winter, beginning: "We are going to the Pole."

The Esquimaux shot three king-ducks; one burgo master and one white gull were seen from the ship. On the 14th, Joe shot a bird called boatswain. He also found, while he was on the plain to the southeast of the vessel, the horns of a reindeer. A white gull was seen flying toward the north, and was watched until it passed around Cape Lupton.

The water pumped from the bilge was led by a hose into the propeller-well, the effect being to free the propeller from ice. There was no improvement in the leak, and it was necessary to keep steam up continually.

Quite a remarkable change of temperature occurred in one hour; remarkable because it was so different

from any experienced during the winter. A northwest wind was blowing and the thermometer stood at +33°.1. A northeaster sprung up and the temperature went up to +41°.5. 1872. June.

On the 16th, a little open water was again seen, and a large white gull was observed flying toward the north. The ashes, sprinkled on the floe, had worked their way, under the influence of the sun, down through the ice until there stood over them a pool of water two and a half feet deep and about two hundred feet long by thirty broad.

Greatly to the disappointment of all, no open water could be seen on the 17th; a flock of geese was seen flying in a southerly direction. On the 18th, a light snow fell. Ducks now resorted in great numbers to the pond a short distance north of the observatory; Hans was fortunate enough to get within shot, and succeeded in bagging one of the beautiful king-ducks.

Mauch took upon himself the labor of preparing specimens during Dr. Bessels' absence. He spent a great deal of time in skinning and stuffing the different birds, in collecting botanical specimens, and in bottling insects. In addition to these labors and the twelve hours' meteorological observations, he kept, as before, Captain Budington's journal, and wrote up the daily log for Mr. Chester. He was a very busy man; and when it is remembered

1872. June. that all these labors were voluntary and beyond his regular duties, too much credit cannot be given to him.

On the 19th, the vessel was leaking worse than before, so that it was necessary to keep the pump going twelve hours out of the twenty-four. The wood was all consumed, and old coal-bags soaked in crude turpentine were used.

On the morning of the 20th, Hans and Joe returned with an ook-gook; they had been gone from the vessel about twenty-four hours. A raven was seen by Hannah.

At last a N. E. gale commenced, producing some effect; open water was seen not more than two miles from the vessel. During the night of the 19th, a severe shock was felt, caused by a crack in the ice. The next day, the wind rose to a velocity of 40 miles an hour; the straits to the west and southwest were completely cleared. Nothing but one broad expanse of water could be seen, dotted over here and there with pieces of ice. It was fully expected that the vessel would clear herself. To provide for such a contingency, all the instruments were taken on board, and everything about the observatory that could be used for fuel was taken to the ship. Two records were left in the building; a general one, giving an account of the expedition, and a special one, containing instructions for the boat-parties.

The wind continued on the 22d, and it was fully ex-

pected that Providence Berg would get adrift and be driven into the straits. The wind, however, died away at noon; the berg kept its place. All the ice outside of it had gone, and the water came to within thirty feet of the stern of the ship. The ice was ten feet thick, and gunpowder failed to break it up. Several gulls were seen during the day and one dovekie was shot. A copper cylinder, containing a record of the proceedings of the expedition up to date, was carefully sealed and thrown overboard. A little to the north of the vessel was a large berg, which, from its peculiar shape, had been known among the sailors as the "Ferry-boat." This was floated, and carried about half a mile to the north, where it grounded. **1872. June.**

On the 23d, the engineers and firemen were engaged in altering large ice-saws, to make them more serviceable in cutting out the ship; a derrick was raised for working them. The captain had now decided to saw the vessel out, and the crew being small, all hands were set to work on the 24th, laboring, with slight interruption, from 2 a. m. to 4 p. m. The lower ends of the poles of the derrick were iron-shod, and it was so rigged as to be easily moved from place to place.

At 7 a. m. of the 25th, the work of sawing was recommenced, and a little after noon it cleared the ice, which was twelve solid feet in thickness to within ten feet of the

1872. June. ship; there, the ice being fifteen feet thick, the sawing was arrested. As this ice was separate from both the berg and the land-ice, it was thought practicable to move the whole mass at once. In order to accomplish this, a very heavy purchase was rigged of four double blocks, the fall of which was taken to the capstan. It finally proved successful, and at 5 p. m., the stem of the vessel was free. Two dovekies were shot during this day.

On the forenoon of the 26th, the saw was again at work. After clearing away much ice from near the vessel a new cut was begun, leading directly into the pond made by the ashes. It was reached at 1.30 p. m., when, immediately the ice opened, the Polaris slid from the tongue of the berg and was once more afloat. She leaked so badly that the steam-pump was at work all day without cessation.

The dogs and everything on the ice worth preserving, were taken on board. Captain Budington determined to start at once, under sail, for the north. There was much open water in sight, and it was possible that Robeson Strait was free, and that a high latitude might be attained. The boat-parties, now absent more than two weeks, were supposed to be at least as far as Cape Joseph Henry, and it was expedient to join them, if possible. The first step was to get the anchors. The starboard anchor lying under Providence Berg was inaccessible. The port anchor lay

clear, but after heaving at it for three hours the crew were unable to break ground. The captain was very anxious to improve the opportunity, if there should be one; the anchor was therefore buoyed and the chain unshackled. At 8 p. m., the Polaris got under way. Beside the captain, there was only one able seaman on board, and he was the cook. 1872. June.

Steering to the north, and rounding Cape Lupton, the ship seemed to have before her a clear sea. Very soon, however, ice was encountered, and on approaching Cape Sumner the pack was found to be impenetrable. Running down its edge she crossed the basin and arrived at Cape Lieber, where, again, no opening whatever was found. All night she traversed the face of the pack in vain. Next day the ship returned to Thank-God Harbor, arriving at 10 a. m., and tied up to her old friend, Providence Berg.

It was observed that there was not quite so much water running aft as usual; upon investigation it appeared that the limber-holes were choked, and the water was backed up. The fore-peak, the chain-lockers, and the main hold were full of water. Many of the provisions were seriously damaged. The carpenter and Fireman Booth were sent below to bore holes in the bulk-heads.

On the 28th, the water at the anchorage was so clear that the tongue of the berg, upon which the vessel had

1872. June. hung all winter, was plainly visible. The damage to the vessel could also be seen. The whole stem was split off and wrenched to port. The part below the 6-foot mark projected at least half an inch beyond the upper part. It was not to be wondered at that the vessel leaked as she did; the only wonder was that she kept afloat.

During the morning, rifle-shots were heard off on the eastern plain, which came from Kruger and Siemens, two of Mr. Chester's boat-crew. There was much surprise at their return, and they were eagerly questioned as soon as they came on board. They reported that both boat-crews were encamped on the ice at the mouth of Newman's Bay; that they had had comparatively little difficulty in getting there, but that it would be impossible to make further progress toward the north. They bore a note from Mr. Chester asking for bread. Captain Budington, after hearing their story, determined to proceed in the vessel and pick the boats up, not only to secure their necessary help in taking care of the ship, but to be ready to move north in the vessel should the opportunity occur.

At 1.15 p. m., the Polaris got under way, but unfortunately encountered as usual the blockade of ice at Cape Sumner. Signals were made for the return of the boats without success. During the night the Polaris traversed along the edge of the pack, which presented an unbroken

mass; and in the morning the captain sent Hans with a note to Chester, directing him to return with the boats, after which the vessel was headed for Thank-God Harbor. Another effort was made to obtain the anchor with an increased purchase, which resulted in getting some additional chain. At low-water (midnight) the cable was hove taut and secured. This broke out the anchor with the rise of the tide, and at daylight it was hove up and catted; lines were then run out to the berg, and the vessel was properly secured. At thirty rods west of the berg, the depth of the water was seventeen fathoms; its temperature at the bottom was + 32°.1; at the surface it was + 36°.8, and the specific gravity was 1.0270. The mean temperature of the air during the day was + 46°; the highest was + 52°. **1872. June.**

The bay still remained free from ice, except a little of the land-ice and a few drifting pieces. At the north the pack was slowly moving toward the south. At the head of Kennedy Channel there was but little ice. The highest temperature recorded in the meteorological journal during June was + 49°; the lowest, + 28°; while the mean was about + 37°.1.

On the 1st of July, the perishable articles on shore were stored, for additional protection, in the observatory, which was covered with a sail.

Captain Hall's grave was made to present a better

1872. July. appearance than was possible when the ground was frozen. It had been surrounded with stones; some soil was transported to it, and a few plants set out. A copper cylinder, containing the history of the expedition, was also buried in the grave. A head-board was set up, on which was painted—

TO THE MEMORY OF

C. F. HALL,

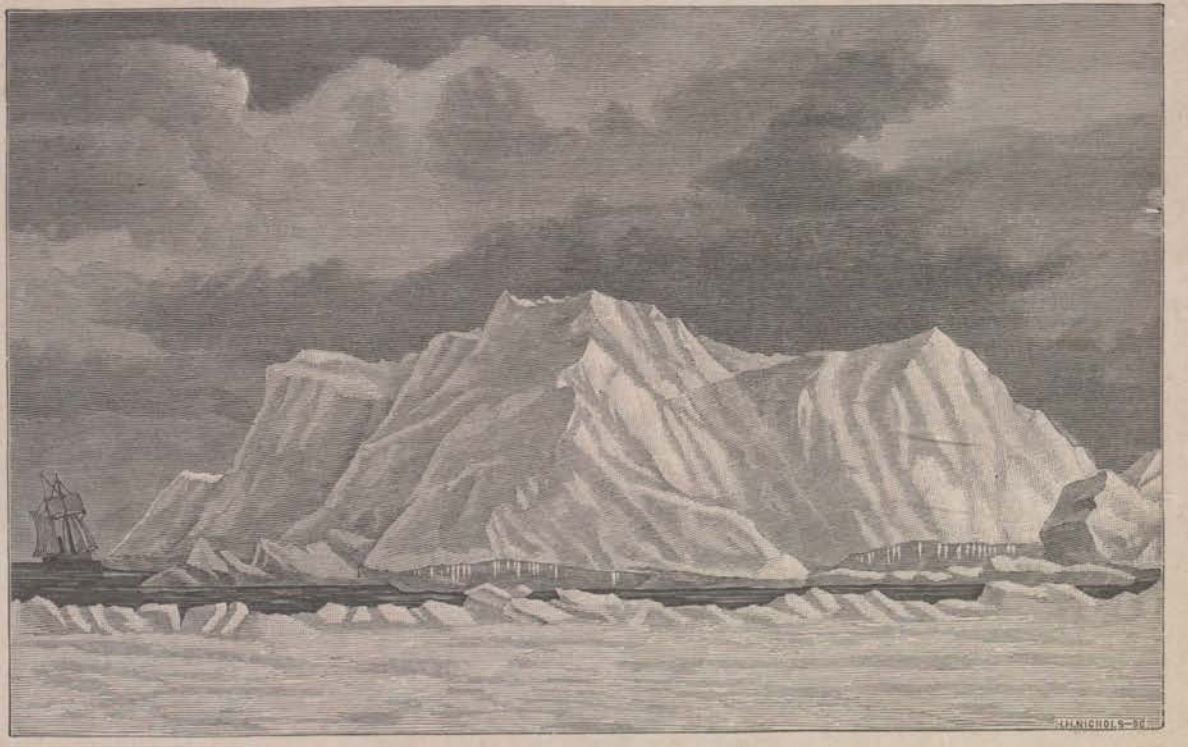
Late Commander of the U. S. North Polar Expedition

Died Nov. 8th, 1871:

Aged 50 years.

At 7 p. m., Dr. Bessels and Hans arrived at the vessel, having walked over from Newman's Bay. They had started at 3 p. m. the day before, and were thus twenty-seven hours on the road.

Captain Budington made another effort to reach Newman's Bay, in order to take off the boat-parties. He ordered steam to be gotten up at 9 p. m., and at midnight the ship was under way. At three-quarters of an hour after midnight she passed Cape Lupton. The sun, which was quite low, blinded the eyes and prevented seeing far ahead. The water seemed to extend a long distance, but at 1.50 a. m. of the 2d, the pack was again met off Cape Sumner. The ship ran southwest down the face of the pack, which extended from Cape Sumner to Cape Cracroft, and through its whole extent there was no



The Polaris rounding Providence Berg, July 3, 1872.

opening large enough to admit a small boat. None could be seen with the glass. At 10.15 a m., Kruger and Siemens were landed at the ravine above Cape Lupton, to carry a letter to Mr. Chester, and also some supplies. The ship returned to Providence Berg at 2 p. m., and was secured by hawsers. A great change had taken place in the ice of the harbor. Providence Berg had at first been connected on its southeast extremity with the land-ice, but now this had gone, and the berg stood clear. Some of the dogs not being found, it was supposed that they had gone adrift upon the ice. **1872. July.**

On the 3rd, the ice began to come down the straits, approaching the vessel; and she was moved to the southeast of the berg. At 7 p. m., a gale from the N. E., assisted by a high tide, set adrift the land-ice; the vessel ran out into the straits, where she was kept under way all night.

At 3.30 a. m., of the 4th, the ship was again made fast to Providence Berg, and nearly all hands turned in. They had been kept up all night working ship. Notwithstanding this, they were turned out at 6 a. m., to protect the vessel from ice drifting into the harbor, to do which it was necessary frequently to change her place. At 6 p. m., a N. E. gale sprang up, bringing down with it large pieces of drift-ice, which frequently threatened to strike the ship; they were, however, kept off by poles.

1872. July. At 9.30 p. m., a piece large enough to be called a berg bore down with great rapidity, threatening to strike the vessel amidships. Its momentum was sufficient to crush in the side of the Polaris, and its approach was watched with extreme anxiety. When within twenty feet of the ship it struck the tongue of Providence Berg, which arrested its progress, turned it off in a southerly direction, and saved the vessel. The tongue which on this occasion had rendered such providential service is the very one which had caused so much injury to the stem and fore-foot during the winter. It was both bane and antidote.

The 4th was to those on board the Polaris a day of very hard work, for which they had been ill prepared by their severe labors of the previous night. They had no enthusiasm to expend in celebrating the day.

The gale ceased at noon of the 5th. The Polaris was then moved in toward the shore, and anchored in 13 feet of water at low tide. Mr. Bryan with Mauch shot one Sabine gull and two boatswains. At 10 p. m., the tide rising, the floes set in toward the vessel, and it was necessary to veer cable. At midnight, a thick fog came over from the west. At 6 a. m. of the 6th, the vessel grounded in 11½ feet of water. Dr. Bessels killed three fork-tailed gulls and two boatswains. Mauch shot a small duck of an unknown species and three dovekies. During the

night a light rain fell. The ice continued to force the vessel farther upon the beach. **1872. July.**

The following soundings were made at 3.30 a. m., the ship heading S. S. W.:

Bow, 13 feet; midships, port side, 11¼ feet; starboard side, 13 feet; stern, 12 feet. At 5.30 a. m., she heeled over so far that the scuppers were under water. An effort was made to haul the ship off at high water, but without success; it was necessary to wait for the night tide. At 2.30 p. m., Hobby arrived on board and reported that Captain Tyson and his party would soon follow.

At 2 a. m. of the 8th, all hands were called, the anchor was hove up, the ship warped off shore, and the anchor dropped in five fathoms of water. The same hour Captain Tyson with the remainder of his crew, and Fred. Aunting, of Mr. Chester's crew, reached the vessel, having walked over from their boat-camp in twelve hours.*

At 3 p. m., a N. E. gale sprang up, accompanied with rain and snow. The floes were so troublesome that the position of the ship was frequently changed.

Early on the morning of the 9th, she was so severely pressed by the floes that it was necessary to resort to the saws to relieve her. These annoyances were frequent during the day and kept the men busy.

* For Tyson's journal on this boat journey see Appendix.

1872. July. Mr. Bryan shot a brent-goose on the plain; it had been the source of considerable sport. When first seen, Hannah wounded it in the wing so seriously that it could not fly. It was, however, very shy and fleet, and did not allow the hunters to get within range. A great deal of powder and shot was wasted on it, and every one who fired was satisfied that his shot took effect, which led to an amusing calculation as to the amount of lead the poor goose carried about with her.

On the 10th, the ice was carried away by a N. E. gale. On breaking out the main hold to ascertain the amount of damage done, it was found that the water had merely spoiled some sugar and molasses.

At 4 a. m., of the 11th, the ship was carried where the anchor was free from ice. There was open water around the vessel for the space of six miles, only here and there icebergs and grounded floe-pieces; at noon the ice set in again, and the scow which had been left unprotected at the ship's side was stove. This scow was a little flat-bottomed boat made at the New York navy-yard for Dr. Bessels. It had proved to be of great service in passing from the ship to shore, and in going out on short hunting-excursions.

On the 12th, new ice formed about the ship, although the temperature of the air was +38°. This was owing to the large quantity of ice in the neighborhood, and the

stillness of the water. The cook killed three dovekies, and Dr. Bessels bagged a golden plover. 1872. July.

On the 13th, the fore-peak was broken out; two barrels of sugar and one of flour were found partially damaged; the spare sails stowed there were taken out and dried. Breezes from the southwest blew all day, but the larger floes were kept off by bergs in the neighborhood of the ship. On the 14th, a very heavy snow-storm began at 3 a. m., and lasted for five hours; in the evening it rained. During the day new ice formed between the ship and the shore.

On the 15th, ten dovekies were killed; the result of the next day's sport was nine dovekies, one lumne, one king-duck, and a duckling.

At 6 p. m., of the 16th, a light rain began to fall. One-half hour after midnight Kruger and Jamka, two of Mr. Chester's crew, arrived at the ship, having been about thirteen hours walking overland. On the 17th, Mr. Meyer returned from Newman's Bay. He was twenty-eight and one-half hours on his journey, having lost his way in a snow-storm, and being compelled to seek shelter under a rock until the weather cleared up. At midnight the rain changed to snow.

A great deal of snow fell; the mountains were covered, and there were large patches on the plain. The whole region looked as it did in the previous September.

1872. July. In the evening, Mr. Bryan and Mauch went out in the scow and shot five dovekies, one Sabine gull, and one fork-tailed gull. Sabine gulls were not very often seen; this one, and that killed on the 5th, were all that were secured. Dr. Bessels had kept the first, but it being injured by shot, he threw it away when the second was obtained, which made a fine specimen.

On the 18th, the pressure of the ice was so great that Providence Berg was partly turned over and stood on end. The ice was piled up in all manner of shapes on its outer side, forming hummocks twenty feet high. The wind shifting on the 19th, and clearing out the ice, the berg resumed its original position. William Nindemann and Fred. Aunting were sent to Cape Lupton in the scow to learn the condition of the ice in Robeson Straits; they returned at 7 p. m. and reported that the ice was close in to the third cape, and the whole strait, as far as visible, was completely blocked.

The only quiet time now enjoyed by the crew was during the prevalence of northeast winds. At other times they were constantly employed in keeping the ship clear of the floating ice. This work, however, had been going on so long that the men had become used to it.

On the 20th, the ice pressed very heavily against the Polaris, especially on her starboard quarter. At 1 p. m., an old floe, more than twenty feet thick, came floating

slowly toward her, much doubt was felt as to her safety; fortunately, however, when within a short distance it grounded. On striking, it broke into many pieces, which, turning over, exposed massive rocks embedded in the ice. These pieces drifted further in, and the vessel, retreating before them, took the ground in twelve feet of water. Happily she was prevented from heeling over at low tide by several hummocks which had grounded near. Great pressure showed itself all about the harbor; Providence Berg was again pressed in toward the shore; one large floe-piece was turned on edge near the ship and towered twenty-five feet above the surface. 1872. July.

Captain Budington says: "During the entire afternoon, while the tide was falling and not much danger existed, we were clearing the hold and hoisting the provisions on deck so as to be prepared in case any accident should happen which would compel us to leave the ship. The hold we found partially filled at the time of low water—no water coming to the pumps. The rest of the day we did not experience any further troubles—the tide falling. The next high tide we have to expect at about 1 a. m. to-morrow morning. Night-tide, according to our observations last winter, being higher, we have to expect the worst. As we cannot move now, we must patiently wait what the ice will do with us. A northeaster would indeed be a blessing."

1872. July. At 1.30 a. m., of the 21st, a loud report was heard like that of a cannon. The people rushing on deck were told by the watch that Providence Berg had split asunder.

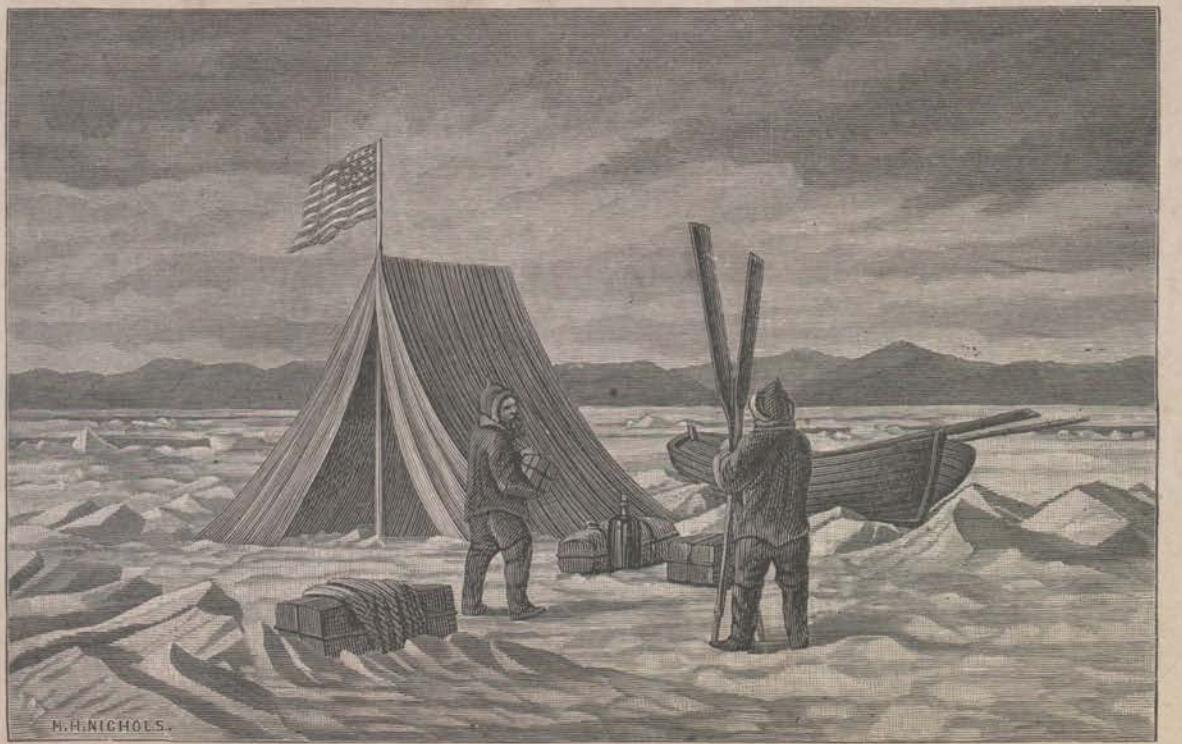
During low water, the men were allowed to go hunting on the plain. They brought in seven brent-geese, three goslings, six dovekies, the nest of a gull with five young ones, and two lemmings.

At low water, on 22d, the ship heeled over so much that it was necessary to lash the boxes and barrels. One duck and one gosling represented the sport of this day. In the evening, light rain fell for a short time. Efforts were made to move the vessel at high water, but without success; at 1 a. m., of the 23d, all hands were called, when she was hauled into thirteen feet of water. While this work was carried on, Mr. Chester and Hermann Siemens arrived from Newman's Bay.* They had waited to get the canvas boat into a secure place on land. At the next low tide the ship again grounded, but was afterward hauled into fifteen feet of water.

On the 24th, Mr. Chester, who had been sick immediately upon his return from the boat-journey, began to show signs of scurvy.

On the 25th, two copper cylinders, containing an account of the progress of the expedition and its plans, were thrown overboard. Mr. Chester was considerably

* For Chester's journal on this boat journey see Appendix.



Boat Camp, Newman's Bay, June to July, 1872.

better, although his gums were still sore and his legs somewhat swollen. The whole crew, with the exception of the two engineers, the steward, and the cook, were divided into three watches, for the purpose of working the large deck-pumps to clear the vessel without steam. The ship was cleared by working the large pumps eight or ten minutes an hour. 1872. July.

On the 26th, a light wind from the southwest helped to bring in the ice, and the harbor was again filled.

On the 27th, Mr. Chester added to the other inscriptions on Captain Hall's grave the following, cut in very deep letters, on a piece of pine wood one inch and a half thick:

In memory of

CHARLES FRANCIS HALL,

late commander

U. S. Steamer Polaris, North Pole Expedition.

Died

Nov. 8th, 1871.—Aged 50 years.

"I am the resurrection and the life; he that believeth on me, though he were dead, yet shall he live."

The kindness and respect manifested by the British Arctic Expedition,—at this moment authoritatively known,—is very gratefully acknowledged.

1872. July. The board was then painted and screwed to the head-board on the side opposite Schumann's inscription.

During the day two dovekies were shot. On the plain the men met, on the 28th, a flock of forty geese, but were unable to secure them. Two lemmings were caught, for which the sailors rigged a cage on top of the galley. This cage had glass sides and many little retreats; and much interest was shown in watching the little creatures and in feeding them.

Early on the 29th, all were startled by a heavy shock from a floe striking the vessel amidships. Joe shot a seal and a dovekie.

Mauch, in his journal, says: "I have been out on shore this forenoon, probably for the last time this season. Taking a walk along the beach down south, I thought that I should fall in with geese, but none made themselves visible. The plants are dying off already; and the willows, which, with their leaves of a beautiful green, gave the plain the aspect of a meadow, are now turned yellow. There are very few flowers, though many seeds. Nearly all the seed-bearing plants are fully ripe."

Beginning at 7 a. m. on the 30th, a light rain fell most of the day.

Captain Budington says, in his journal of the 31st: "I have been on the summit of the high bluff just north of the observatory, where I had a view over the ice of

"the straits. Towards the north, where Robeson Strait leads into our basin (which I would like to see called Hall's Basin), there is a body of open water, and a long streak appears to extend from there along the opposite coast, where I was able to trace it as far as Cape Lieber. Abreast of our bay, about one-half a mile off, west of Providence Berg, there is a very extensive floe, taking up the greatest part of this basin. I was unable to make out any motion in the floe in either direction." **1872. July.**

The highest temperature observed during the month of July was +53°.3 F.; the lowest was +34° F.; the mean was +42°.3 F.

XVII.

CHAPTER XVII.

On the 1st of August, Hans was sent to the top of Observatory Bluff to report on the condition of the ice. It proved to be very compact, with the exception of a little water near the western coast. He felt a strong southwest gale on the bluff, while it was calm at the ship. Hans took daily trips to the mountain, where, to insure accuracy, he made a pencil-sketch showing the patches of open water. In this way, the captain was able to determine the daily movements of the ice and to judge of the probabilities of an early opening. 1872. August.

A careful estimate of the quantity of coal on hand was now made by the engineers, who reported that there was only enough for six days' steaming—a supply sufficient to carry the vessel, under favorable circumstances, to Disco. Captain Budington then determined to start toward the south as soon as an opportunity presented itself.

On the 2d, Mr. Odell reported that he had traveled

1872. August. over the hills to the shore of Robeson Channel, and found it completely blocked with very heavy ice. He had for several weeks been in the habit of making daily pilgrimages to the summit of Observatory Bluff, where he amused himself in erecting a high pillar of stone. It was nearly six feet square at the base and from eight to ten feet in height, and was compactly built. Upon one of the largest stones in its side, he cut his initials, the name of the vessel, and the date. As a large flock of brent-geese was flying past the vessel at a distance of not more than fifty yards, Hobby killed one with a ball from a Sharp's rifle.

On the 3d, from 2 to 4 a. m., rain fell. At 2 a. m. of the 4th, a very high tide brought off the large floe to which the Polaris was attached, and, as it floated off, the hawser which connected it with the vessel parted; the ice in general was loosened, and some sunken pieces rose up, striking the ship with considerable force. The hummocky pieces forced her astern, and her motion in that direction was accelerated by attempts to haul in the cable. The consequence was that the ship grounded, and, at low water, there was at the stern a depth of four feet less than she drew. At the next high tide, however, she again easily floated. During the day, a great many dovekies were shot, and about two dozen snipes. The sun at midnight now disappeared behind the bluff.

At 1.30 a. m. on the 5th, all hands were startled by

a very severe blow which the vessel received on her starboard quarter from a floe turning over. Young ice now began to form about the ship whenever it was calm. Hans went out in his kyak toward the south, and shot three brent-geese and several plovers. About six miles down the beach, he found one of the best hunting-dogs (a very excellent musk-ox hunter), wounded, probably by a musk-ox. His name was "Shoemaker". He had been missed eight days. One of the seamen immediately started down the coast to carry some food to the sufferer, and, on the 6th, Hermann Siemens and Peter Johnson went down to bring "Shoemaker" to the ship. They carried him in a blanket, which was slung on a pole borne on their shoulders. The poor dog was very much cut up; there was a hole in his side between two of his ribs, and one through the fleshy part of his leg. These holes were about the size of a musk-ox horn; his belly was gored and cut, and nearly all the skin taken off. The two Esquimaux were out all day in their kyaks. They found many geese. Hans shot thirteen and Joe twelve, of which several were goslings. One of the crew shot a boatswain and several plovers.

1872. August.

Kruger and Hobby obtained permission to go to Newman's Bay after the clothes which they had been compelled to leave there. Captain Budington says in his journal: "Each of them belonging to a different watch, I

1872. August. "granted their request, as one man always can be spared and seven can work the pumps. They left in the afternoon. However, I found myself forced to give them especial orders to return immediately in case they should encounter a northeast breeze, for I intend to take the first opportunity I get to leave this harbor. A delay at this advanced season will most probably prove fatal. As we will be unable to keep the vessel afloat in her present condition during another winter, we will be compelled to run her on the beach. I have always been living in hopes that we should get farther north with the vessel; but this season is so unfavorable, the ice being so compact and close, that we may almost consider our return this year an impossibility. Since the return of the boat-parties, we have not had an opportunity to start north; and, even if we had such an opportunity now, it would not be at all advisable, without enough coal, to risk it with a vessel like ours at this advanced state of the season."

On the 8th, all hands rejoiced to hear from the hill-top that there was open water not more than eight miles from the vessel. The Esquimaux shot four seals, but were able to secure but one. At 3 a. m. of the 9th, the two seamen returned from Newman's Bay, and reported that there were a few leads in the ice toward the north, but that south and west, it was very close. At 11 a. m., Meyer, Siemens, and Linquist started for Newman's Bay;

the first, to recover some instruments; the last two, to get their clothes. They reached the boats at 7 p. m., the traveling being very good, as the land was free from snow, and the streams in the ravines were either very low or completely dried up. **1872. August.**

Captain Tyson saw open water from the crow's nest, four or five miles distant. Hans shot two seals, although he only brought one to the ship. At this season of the year, the seals are not very fat, and when killed sink quickly, so that the hunter must be active to secure them. On the 10th, a light wind from the N. W. sprang up, but did not last long; the hope that the ice would be driven to the southward was not realized.

Dr. Bessels, assisted by Hayes, was engaged in making preparations for taking photographic views; they were not, however, successful. A number of snipes and turnstones were shot. At 10 p. m., Mr. Meyer and party returned from Newman's Bay. He brought for the doctor his valuable microscope, which had been left there with the boat.

Siemens in his journal says: "Off Newman's Bay, the strait was beset all over; not a single strip of open water being visible."

Thin ice now began to form every night between the ship and the shore, and it became difficult to force the scow through it. It is noticed in one of the journals that the ice thus formed was quite fresh.

1872. August. On the 11th, the ice of the straits was observed to be in motion, drifting to the south.

A large space near the observatory was covered by a luxurious growth of wheat about eight inches in height. Among the stores that had been placed on shore was a barrel of wheat. In moving this, its head was broken in, and a quantity was scattered on the ground, which had grown up, presenting the appearance of a verdant oasis. The dogs were very fond of nibbling the tender stalks.

At 6 a. m. of the 12th, Mrs. Hans Hendrick was safely delivered of a boy. All were much surprised and pleased at the advent of the little stranger, who was unanimously named by the crew Charles Polaris Hendrick.

Hans, from his trip to the hill, brought back such a favorable report that Captain Budington went to examine the ice. He decided that it would be safe to try to force the vessel through, but sent Captain Tyson up to the hill, who returned at noon confirming his own judgment. Accordingly, every preparation was at once made. The dogs, twenty-one in number, were taken on board. An effort to get the anchor proved unsuccessful, in consequence of the ice resting on it; Providence Berg had not yet released the other anchor, so that both had to be abandoned.

A list of the stores left on shore will be found in Appendix No. 2. These were intended as a provision for a future emergency.

At 4.30 p. m., the engines were started, and the Polaris left Thank-God Harbor. Just as the vessel got in motion, one of the best dogs, a Newfoundland, named Tiger, leaped over the stern bulwarks upon the ice. His loss was greatly regretted; he was a general favorite. **1872. August.**

The ice was quite compact; but, with great care, the vessel was piloted between the heavy floes, changing her course frequently, but always gaining ground; she labored heavily all night. At 5 a. m. of the 13th, the open water which had been seen from Observatory Bluff was reached, and the vessel seemed to rush with extraordinary speed, until it was necessary to shorten sail, on account of the thick fog, which lasted an hour. The coasts on either side were carefully examined, and it was discovered that there were several glaciers on Grinnell Land, although none of them had discharges into Kennedy Channel. At 9 a. m., a very close and impenetrable pack was encountered. The vessel was tied to a large floe, and drifted slowly down the channel with the pack; about noon, she was quite near Hans Island and west of it. The latitude by observation was 80° 48′ N; longitude, 68° 38′ W. The ship continued to drift, and at 7 p. m., was midway between Hans and Franklin Islands, which are ten miles distant from each other. Soundings were taken at a depth of 203 fathoms, with a bottom of black limestone. The temper-

1872. August. ature at that depth was 32.8, and the specific gravity 1.0281.

At 11 p. m., the ice opened somewhat, and one hour's hard labor secured an advance of one mile. During the morning of the 14th, several unsuccessful attempts at farther progress were made; and, at noon, the opening of a lane enabled the ship to get close to Franklin Island in forty-five minutes. On passing it, the grand spectacle of a huge land-slide was witnessed, in which immense clouds of dust were raised, accompanied by a loud noise.

At 2.45 p. m., Cape Constitution was passed, which Morton and Hans both recognized as the highest point reached by them on their memorable sledge-journey when with Kane, in the spring of 1854. During the day, Hans shot a small seal. At 11 a. m., a very close pack was encountered, and it was necessary to secure the vessel to one of the floes. By a subpolar altitude of the sun, the latitude of 80° 02′ N. was obtained. Several unsuccessful efforts were made to force a way through the ice; at 10 a. m. on the 15th, it opened somewhat, and the vessel was again started; after a few hours, however, the ice once more closed, and the engines were stopped, having propelled the ship about six miles toward the west.

At 6 a. m. of the 16th, Mr. Meyer obtained, by the change in the sun's altitude on the prime-vertical, 80° 01′ N. for the latitude. The Polaris remained all day fast to the

floe. There was now only coal enough for four days' steaming; the prospect of reaching Disco during the fall began to look dismal. The latitude obtained at noon was 79° 59′ N. **1872. August.**

On the 17th, the ship received a slight nip, which made her heel considerably. Every preparation was made to have things ready to be thrown, if necessary, upon the ice. Water was seen at an estimated distance of eight miles to the south, but it was impossible to reach it. At 10 p. m., the vessel received another severe nip, which continued for an hour, and was attended with considerable heel. The latitude at noon of the 18th was 79° 44′ 30″ N. Henry and Bache Islands could be seen from the crow's nest.

On the 19th, soundings were made, and the depth found to vary from ninety to ninety-five fathoms. The ship was now being pumped by steam, and, the leak having very considerably increased, the pump was kept going twelve hours out of the twenty-four. At 10 a. m., a large floe to the north began to move, and would have struck the vessel had she not been at once warped a short distance ahead and secured in a bight. The removal had scarcely been effected when a collision of the two floes occurred with great force, exactly where the ship had been moored.

During the 20th, light rain fell at intervals, making everything disagreeable. Notwithstanding this, the crew

1872. August. was employed in constantly moving the ship to save her from being caught between floes. It was aggravating to see clear water at a distance, to which there was no access. During the prevalence of a S. W. wind, it was thought that the vessel was drifting to the north; but at 4 p. m., the wind shifting to the north, the southerly drift was unmistakable. Latitude at noon, 79° 42′ N.

On the 21st, the fires were drawn to give the engineers an opportunity to repair the little boiler; in the mean time, the deck-pumps were started to keep the ship clear. It was then manifest that the ship was leaking much more than she did when in Thank-God Harbor. The latitude at noon was 79°-39′ N. At 10 p. m., the vessel suffered a very severe nip, which listed her over to port so much as to be decidedly uncomfortable. A southwest gale prevailed on the 22d, and a light rain fell for several hours. The dogs, for the first time since leaving Thank-God Harbor, were allowed to go on the ice.

The latitude, at noon of the 23d, was 79° 37′ N. Magnetic bearings were taken daily for the correction of the coast-lines, and some grave errors in that of Grinnell Land were noticed. The temperature during the night now began to be as low as 28°; its effect was very plain.

At 6 a. m. of the 24th, a breeze from the north sprang up, and assisted the current very materially in carrying the vessel toward the south.

At 9 a. m., the ice opened somewhat, and, steam having been raised in the little boiler, it was hoped that some progress might be made; but the lead closed before the vessel started. The land explored by Kane south of the great Humboldt Glacier was now plainly visible in clear weather. A great line of bergs stretched out from Humboldt Glacier similar to that seen when the Polaris was passing up through Smith's Sound. The vessel was nipped several times during the day, but not severely; she gave proof of her strength and of her fitness for ice-navigation. **1872. August.**

The temperature during the night fell to 26°.6, new ice being rapidly formed, half an inch in thickness.

Mauch says in his journal of the 25th: "The ice is opening a few hundred yards from us, but so little that we cannot take advantage of it. The surrounding ice consists of heavy floes, between which it would not be advisable to try to force the ship; her fate would soon be sealed. Although our prospects for a release are somewhat dreary-looking, nobody appears to be down-hearted, a fact which makes me conclude one thing, that they do not appreciate a winter in the pack, or that they are Arctic heroes, fit for such expeditions. The officers are, of course, aware that, ten chances to one, we are lost if we should not be able to reach the land; but they do well in not expressing their feelings, so as to keep up good spirits among the ship's company."

1872. August. At 10 p. m., one of the men shot a large seal from the vessel; the scow was lowered, and the seal secured.

At 6 a. m. on the 26th, the ice again opened, and the captain ordered steam to be raised, hoping to be able to find a passage. At 8 a. m., he cast off, and, having crossed the open space of water, entered the only lead in its neighborhood. Following it with great difficulty through its intricate windings, he found it to be a blind lead. At 10 a. m., it closed, when the Polaris, having for a whole hour worked in vain to force herself through, was tied up to a floe. The drift during the day seemed to be toward the east. Latitude at noon, 79° 36′ 30″ N.

The blades of the propeller were found to be somewhat bent. Every precaution was taken to keep the well free. While the ship was in motion, a man was stationed there to signal for the engine to be stopped whenever the blades were about to strike a piece of ice. Notwithstanding this care, the blades had suffered.

The sun, which since April had remained above the horizon, now disappeared for a short time at midnight.

On the 27th, every preparation was made for a possible abandonment of the vessel. Considerable open water could be seen toward the west, but it was wholly inaccessible. Rensselaer Bay and Cape Isabella, or land near them, could be seen from the mast-head. Toward evening, the pressure being slack, the vessel was

warped between the floes which had brought her up the day before. 1872. August.

On the 28th, there were several leads not far to the west, but the ice was too close to enter them. The vessel was warped for several hours without making much progress. Latitude at noon, 79° 35′ 47″ N.; longitude at 6 p. m., 69° 09′ W.

On the 29th, toward evening, water was seen to the westward not more than three miles distant, and an attempt was again made to warp the vessel through a lead which promised to afford an opening. After four hours' hard work, the young ice, which was two-thirds of an inch thick, proved to be too great an obstacle, and steam was raised to overcome it. The vessel worked laboriously until 6 a. m. of the 30th, but during all these hours succeeded in pulling out of the way only one small piece of floe; this allowed her to advance not more than once her own length. The latitude at noon was 79° 35′ N. One ivory-gull was seen during this day—the only thing of life in all that waste of ice.

By observation of the land, the vessel seemed to drift on the 31st, a few miles N. then S., and so on, first in one direction and then in the other. Her drift to the E., and her delay at this point, were attributed to a discharge of ice from Hayes' Sound. Another suggestion was that Smith's Strait was actually blocked up, and

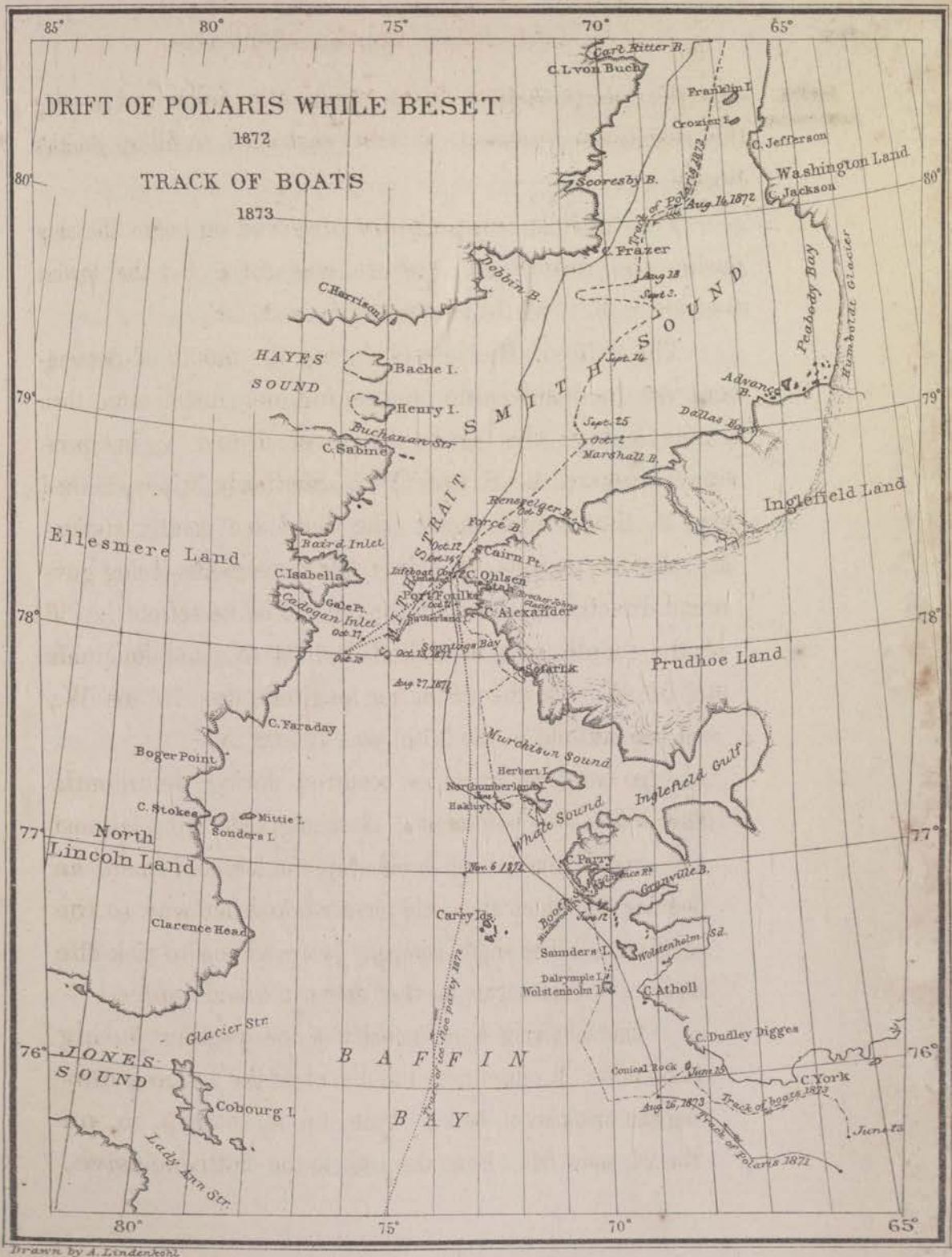
1872. September that the ice pressing down from the north, and meeting this resistance, passed to the eastward to fill up Smith's Sound.

The highest temperature observed on board the ship during the month of August was 52°.8 F.; the lowest was 28°.9 F.; while the mean was 37° F.

The drift of the vessel during the month of September was inconsiderable, averaging not much more than a mile a day; she probably never drifted N., but principally toward the S. and W. Southerly winds checked her at times, and again she remained nearly stationary during periods of calm; her movements being governed directly by those of the ice. The vessel on the 3d of the month, was in latitude 79° 34′ N., and longitude 68° 56′ W. On the 28th, her longitude was 70° 48′ W., and her latitude on the 30th, was 79° 02′ N.

No very severe gales occurred during the month. This was a disappointment. A strong gale from almost any quarter would have broken up the ice, and made an opening by which she could have worked her way to the southward. The ship's company were willing to risk the dangers of such a gale for the benefit it would confer.

The following is a summary of the weather during September. It rained from 1 to 3 a. m. of the 1st, and during the first part of the 2d. From 4 p. m. to 10 p. m, on the 2d, snow fell. From the 18th to the 26th inclusive,



Drawn by A. Lindenkohl

with the exception of the 23d, snow fell every day, almost always from midnight until 5 or 6 o'clock in the morning. The fall at any one time was not heavy, although the whole amount during the eight days was large. Thick fog gathered about the ship at 7 p. m. of the 3d, and continued throughout the 4th. On the 9th and 10th, it renewed itself, and again on the 15th and the 30th. One of its effects was to cover the spars and rigging with great ice-crystals, which gave the vessel a wintery appearance. **1872. September**

The condition of the ice during this month was as follows. On the 1st, a few detached pools of water were seen, the land being on this day covered, as it was also on the 29th, with thick clouds. On the 2d, the ice was quite active, moving in various directions and piling up large hummocks. On the 4th, the young ice had become sufficiently thick to bear the dogs. On the 8th, an open space of water was seen to the east of the ship, but entirely inclosed. On the 11th, the few open spaces to the north and west were not large enough to tempt the captain to try to get the vessel into them. At 8 p. m. on the 14th, a large floe moved down toward the vessel, breaking up in its progress young ice four inches in thickness. Fortunately, some larger ice interrupted and arrested its progress.

On the 15th, there was a slight motion in the ice, which, however, produced no effect on the vessel. On

1872. September the 19th, open water was seen to the S. W. and W., not more than five miles distant. It was an opening which would be closed in a moment, and yet the idle fancy indulged itself in imagining what might be done by a vessel in a couple of days in such water and in certain directions. It had, however, become the universal opinion that the ship would winter in the pack. At 9 a. m. of the 30th, the floes—between which the vessel was—separated and left an open space seventy-five yards wide on the starboard side of the ship.

At 9 p. m. of the 16th, the full moon rising in the east was distorted, being twice its natural size and very red. The light had diminished so much, on the 27th, that a lantern had to be used to read the instruments from 8 p. m. to 4 a. m.

On the 2d, the hold had been cleared out, and twenty barrels of pork and four tierces of molasses were brought up on deck. In order to have everything in readiness for disaster, the gaff-topsail and the storm-staysail—sails that were not of much use under even the most favorable circumstances—were unbent and cut up into bags for bread and coal; and, on the 4th, two tons of coal were brought on deck in the bags. On the 10th, the stores from the rooms forward of the men's quarters were also taken on deck.

It began now to be necessary to have lamps about

the ship, and the only kind of oil that remained, in any quantity, was seal-oil. The Esquimaux were expected to catch a sufficient number of seals during the winter to keep the ship supplied with oil. Among the stores, there were one or two students' lamps, which, on the 11th, were tried with seal-oil, and found to work admirably, after arrangements had been made to regulate the flow. **1872. September**

Drinking-water was obtained from the pools in the floe, and sledded to the ship. It was found, however, to be somewhat brackish, and it was feared that it would prove deleterious. Special care was taken to get the water as fresh as possible; but, as the ice increased over the little ponds, their water became unfit for use; ice was then obtained from some bergs in the neighborhood, or from the tops of old hummocks.

Some changes were now made in the ship to add to the comfort of the officers. The forward state-room on the starboard side, occupied by Mr. Chester and Captain Tyson, was enlarged by taking in the passage-way; a small stove gave them sufficient warmth, and a hurricane-house was built over the entrance to their room. Joe's room, which adjoined Mr. Chester's, was enlarged in the same way; its entrance being aft, from the passage-way. To protect the cabin, a door was cut through into the starboard passage-way, and the door leading directly out of the cabin was closed.

1872. September Hans and his family having returned to the forward state-room, occupied by them during the winter, the cook and his culinary utensils were removed down to the lower cabin. The pipe from the galley-stove led up through the upper cabin, and was expected to afford considerable heat there.

On the 16th, a house on the floe was begun. This floe, to which the vessel had been attached for a long time, was about three miles in circumference, and nearly round. It was quite a heavy floe; its average height above the level of the water being about five feet. Its surface was very broken, and many of its depressions contained fresh-water ponds. Its edges were piled high with hummocks, thrown upon it by severe ice-pressure.

A large lake was selected, about two hundred yards from the ship, the smooth surface of which was made the site of the house. The lake was protected on the north and south by high ridges of hummocks.

Captain Tyson was appointed master-builder, and was assisted by Morton, Bryan, Mauch, and Esquimaux Joe. The house was designed to be 27 feet by 24, and to face toward the S. E. Holes were dug in the ice for poles, in which they were allowed to freeze. Twelve were set on each side, and three large ones placed across the center to support the roof, which was to be of canvas.

In sinking the large poles, the floe was cut entirely through at a depth of six feet. **1872. September**

The leak in the Polaris continued to give trouble; nine hundred pounds of coal were used daily in working the pumps. Many plans for stopping the leak were tried without success; Chester and the carpenter went down into the forepeak, and worked in vain at it several hours. It was then decided to attempt freezing the water in the vessel, and 90 fathoms of small chain were payed down the forepeak into the water—to hasten the freezing of which a wind-sail was rigged to carry the air down upon the chain. On the 11th, the ice having been cut away, a sail was stretched under the bows. Again, on the 13th, it was attempted to make the after bulkhead of the forepeak water-tight. At the same time, oakum was stuffed into the leak on the outside under the sail. But after all had been done, the leak proved to be as bad as ever. The engineer now turned his attention to a more economical use of fuel in keeping the ship clear. In the fire-room, there was a small boiler designed to be used with the apparatus for burning oil. Schumann believed that if he could fix up this boiler and make the proper connection, he could raise sufficient steam to keep the donkey-pump at work—a pump which had only been intended to fill the engine-boilers with water. The boiler was moved aft and secured to a bed made for it; and its smoke-pipe

1872. September was run up through Joe's room to heat it. Fortunately, it was made to work very well, consuming only 350 pounds of coal a day, and keeping the pump constantly going. A careful estimate on the 23d, of the quantity of coal still on hand gave 20 tons. The constant work, day and night, of the little pump, proving too much for it, it broke down on the 29th. The bilge-pump was set to work while the former was repaired. In these emergencies, everything depended on the skill and industry of Mr. Schumann. His energy and resources rose with the occasion; and he was ably seconded by his assistants, especially by Booth.

The second whale-boat was now taken off the house, where it had been stowed, and hung on the forward davits on the port side, to be ready to be lowered at a moment's warning.

During the first two weeks of the month, many birds and seals were seen, but none killed. A turnstone was seen on the 3d; a flock of dovekies on the 9th; dovekies, eider-ducks, and three seals on the 10th; and a few seals on the 13th. During the next week, Hans was the successful hunter, although both natives went out every day, and, skirting the edge of the floe, watched for seals in the open spaces or in the young ice. Hans shot three dovekies on the 14th, and on the 16th, 18th, and also on the 21st, succeeded in catching a seal. On the 18th, Joe saw some

walrus, and fired at them without success. During the next week, Joe was more fortunate, shooting two seals on the 22d, one on the 23d, one on the 24th, two on the 26th, three on the 28th, one on the 29th, and one on the 30th. On the last of these days, many other seals and also some eider-ducks were seen. Hans did not meet with so much success, but caught one seal on the 28th and one on the 29th. A large number of the seals were immediately eaten, and many were stored by the captain, who thus commenced laying up provision for the winter. **1872. September**

While hunting on the 24th, Joe had quite an adventure. He had killed a seal in open water not far from the edge of the floe, and, not having his kyak with him, he ventured after the seal on a cake of ice. The cake broke into two pieces, and as neither piece singly had sufficient buoyancy to bear him, he placed one foot on each, and, catching his harpoon in the firm ice, slowly drew himself in with his prize.

Mr. Meyer began to show signs of scurvy. At first it was thought to be rheumatism; but his leg became drawn up so badly that he was only able to touch the toe of his foot to the ground. He was very reluctant to take the medicine which the captain prescribed, namely, fresh seal-blood and raw meat. It was, however, prepared in various ways, and his principal diet for a long time was seal. He recovered slowly under that regimen.

1872. October. On the 1st of this month, there was considerable movement in the ice, and the large floes were heard grinding against each other and crushing the young ice. The vessel did not, however, suffer; the projections on either side of the bight, in which she lay, kept off the heavy floes. A good deal of open water was seen to the S. and S. E. along the land. The latitude observed on this day was 79° 00′ N. The minimum temperature during the previous night was —1°.6 Fahr. This was the first time since the winter that the thermometer had fallen below zero.

The hours of the previous winter, for meals, were now resumed; breakfast being at 9 a. m. and dinner at 3 p. m. Mr. Chester tapped a barrel of beer, which he had prepared, and it received the hearty commendation of those who tried it.

Hans succeeded in catching a seal under unfavorable circumstances. He killed the animal, and, in order to reach it, he used a small piece of ice as a float, ferrying himself out in the little pool. When in the midst of the water, the ice closed; the little piece of ice upon which he was, turned over, and Hans got a ducking; he was rescued with the assistance of Joe, after much labor; like a good fellow, he kept fast to the seal all the time, and brought it to the ship.

On the 2d, the vessel suffered a slight pressure. Robert

Kruger shot a seal, and Joe was equally successful. At 11.30 p. m., Mr. Bryan determined, by observing the altitudes of two stars, the ship's position to be, latitude 78° 59′ N., longitude 70° 35′ W. **1872. October.**

On the 3d, the vessel experienced a very severe nip. In the morning, Joe caught a large ookgook, and in the afternoon a smaller seal. The ookgook was 8 feet long and 6 feet in circumference; it was supposed to weigh 600 pounds and to contain a barrel of oil. An eider-duck and an Arctic owl were seen near the vessel. Latitude observed, 78° 58′ N.

The ship was in a thick fog on the 4th from 3 to 8 a. m.; she was rapidly approaching the land; Rensselaer Harbor was thought to be not more than twenty miles distant.

Captain Tyson finished the frame of the house on the floe; it stood ready for its canvas covering. Mr. Meyer's scurvy had almost disappeared. Two eider-ducks were seen on the water near the ship. Hans caught a seal, and Joe brought three to the ship. The two Esquimaux went out regularly every day, and walked along the edge of the floe, watching for seals in the little pools that were formed at different points. They were watched from the vessel with a glass, and whenever the signal was made, the dogs were harnessed, and carrying the scow, were driven with great rapidity to the place to bring back the seals. On

1872. October. this day, Joe signaled that he had killed a seal, and Jamka, who was nearly always on watch, with Aunting, started at once with the dog-team. Jamka was the most successful dog-driver in the crew. They launched the scow, and had just landed the seal on the ice, when another bobbed up its head to see what was going on, and Joe shot it. As they were paddling after the second, a third appeared, and looked inquiringly around. He stayed up long enough for Joe to level his rifle at him, and was added as another trophy.

On the 5th, the ice moved considerably; the floe swinging round and the vessel shifting her head from N. N. W. to W. ½ N. The house on the floe was now covered with canvas made from the awnings which had been spread over the deck the winter before. From 5 to 10 a. m. on the 6th, a gale from the south prevailed with snow. The latitude observed was 78° 57′ 30″ N.

Snow fell on the 7th from 2 to 7 a. m. Part of the crew were employed in finishing the house on the floe, and another part in hauling ice to the ship. The engineers had made arrangements to melt ice, so as to have fresh water for the little boiler. Mr. Schumann had fitted a blow-off so as to clear out the salt that was left in the boiler, but it did not keep the boiler entirely free from incrustations; it was thought best to use fresh water. Joe caught another seal, and he found that a snow wall

which he had erected to shield him from the winds while waiting for seals had been torn down by a bear, and that the animal had followed him nearly to the ship. **1872. October.**

On the 8th, the house on the floe was completely finished. Hans caught two seals and Joe, one. So many had now been caught that it was thought there would be enough blubber to supply oil for the winter's use; and so much meat had been packed away that no apprehension was entertained of scurvy during the winter. The latitude observed was 78° 47′ 45″ N.

On the 9th, there was much motion in the ice. Many large hummocks were found, and the vessel drifted rapidly. Mr. Meyer, by the bearings of two or three prominent capes, determined the ship's position to be latitude 78° 45′ N., longitude 70° 15′ W. Eighteen hundred pounds of bread were placed in bags and carried to the house on the floe. Hans caught two seals. Two of the men out hunting saw a bear. They fired several shots at it, but failed in wounding it mortally; it escaped over the rough hummocks toward the shore. When this was reported at the ship, there was a general rush with all sorts of weapons toward the scene of action, but Bruin was out of sight.

On the 10th, Cape Grinnell was thought to be twelve miles distant. The leak in the Polaris had somewhat diminished, and it was hoped that soon the water in the fore-

1872. October. peak would freeze up and no more pumping would be needed. Two seals were caught.

On the 11th, the hut at Anowaytok, mentioned by Kane, was seen, and recognized by both Morton and Hans. It was about six miles from the vessel which now began to drift very fast, and there seemed to be a prospect of her passing out of Smith's Sound before the winter. Many, however, still believed that the Polaris would be detained there until the following summer. Joe caught a seal. Some alterations were made in the seamen's quarters to insure greater comfort.

At 8 a. m. of the 12th, Cairn Point was only two miles to the S. E., and the ship was moving rapidly. At 9 a. m., two parhelia were seen. The latitude observed at noon was 78° 28′ 21″ N. Joe caught a seal. The little donkey-pump again broke down, and while the engineers were engaged in repairing it the bilge-pump in the starboard passage-way was used to keep the vessel clear.

On the 13th, Gale Point was due west at noon. The N. E. gale which had been prevailing for two or three days had materially assisted in carrying the vessel to the southward. During the morning of the 14th, the vessel was drifting quite rapidly down the middle of the straits.

The floe was turning, and at times it made a complete revolution. The tracks of three bears, one old

one and two cubs, were seen near the vessel. They were probably prevented by the dogs from coming nearer. Joe caught a seal during the day. Mr. Meyer was entirely restored, and was in perfectly good health and spirits. **1872. October.**

Northumberland Island was now in sight, far to the S. E. A fresh breeze from the west sprang up toward evening.

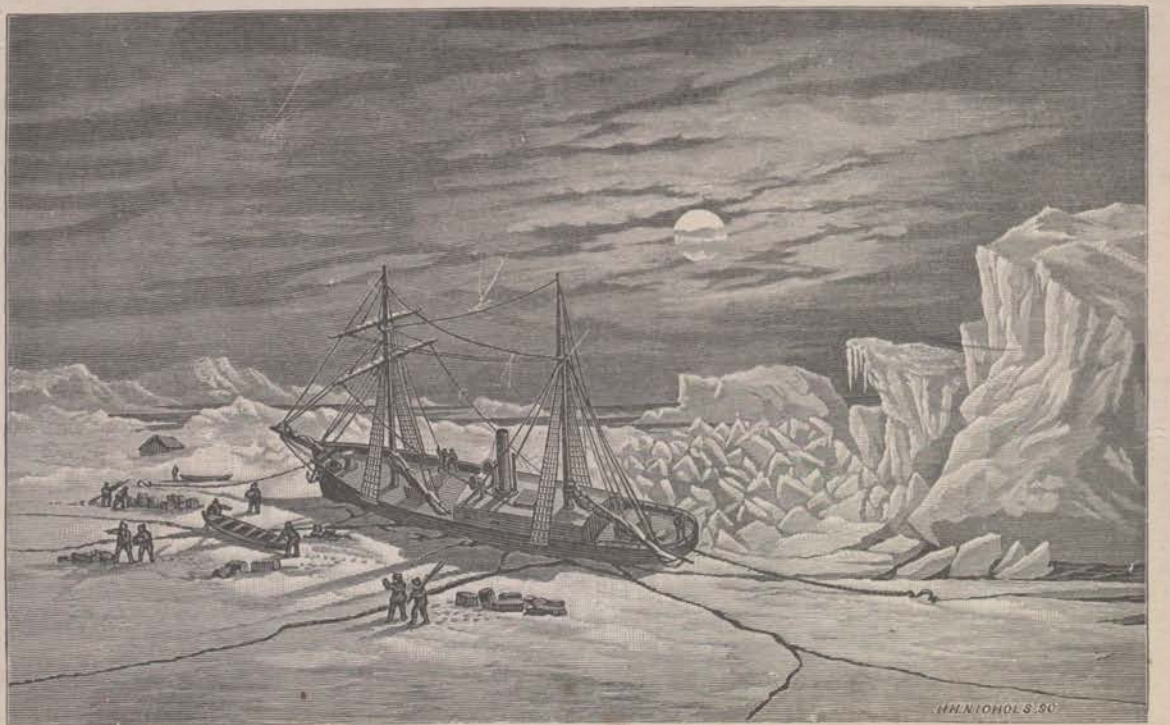
At 5 a. m. of the 15th, a very heavy snow began to fall, and continued until 8 a. m., when the wind blew so hard that it was impossible to distinguish between the falling and the drifting snow. The gale increased to 40 miles an hour, and continued all day, driving the vessel with its surrounding ice with great rapidity. It commenced to blow from the S. E., but shifted to the S., and finally to the S. W. During its prevalence, the air was so completely filled with the flying snow that one could not see more than 20 or 30 feet. The ship had remained fast to the floe so long, and drifted with it so far, that no particular anxiety was felt as to the result. The captain had, however, always said that if the vessel passed through Smith's Strait, he would not feel easy until the ice in which she lay, had joined the regular Baffin's Bay pack. The "north-water", as it is called by whalemen, is always found in the northern part of Baffin's Bay; and he knew that, were this safely crossed, the ship would

1872. October. float quietly down with the pack all winter, and be released in the spring far to the south.

The direction in which the vessel was moving was a matter of speculation; the fact of her moving was admitted. The daily work being done, after dinner the men settled themselves down as usual for the enjoyments of the evening. At 6 p. m., it was reported that the starboard side of the vessel was free from ice. The captain turned up the people, and secured the ship by an additional hawser to the floe. This extra hawser was over the stern, and led from a large ice-anchor, sunk in the floe, to the main-mast. Two hawsers had served during the whole of the drift to hold the Polaris to the floe, one over the bows and one over the stern.

Final preparations were made to abandon the vessel; nearly everything had been got ready on deck; the seamen still had their clothes and personal effects to look after.

The Polaris was driven along at a very rapid rate. Many eager faces looked over the rail and peered into the darkness and the gloom, wondering what would happen next. The sky was threatening. The moon struggled in vain to break through the clouds. Two icebergs were passed in close proximity. Some judgment could be formed by means of them as to the rapidity with which the vessel was moving. One could scarcely help shud-



Before Separation, Oct. 15, 1872.

dering as he thought of the consequences of running into one of those gigantic ice-mountains. One or two persons thought the land was visible, but it was very uncertain. **1872. October.**

At 7.30, the vessel ran among some icebergs, which brought up the floe to which she was attached; at the same time, the pack closed up, jamming her heavily; it was then the vessel received her severest nip. It is hard to describe the effect of that pressure. She shook and trembled. She was raised up bodily and thrown over on her port side. Her timbers cracked with loud report, especially about the stern. The sides seemed to be breaking in. The cleat to which one of the after hawsers was attached snapped off, and the hawser was secured to the mast. One of the firemen, hurrying on deck, reported that a piece of ice had been driven through the sides. Escape from destruction seemed to be impossible. The pressure and the noise increased together. The violence of the storm, the darkness of the night, and the grinding of the ice, added to the horror of the situation. Feeling that it was extremely doubtful whether the ship would stand, Captain Budington ordered provisions and stores to be thrown upon the ice. Then followed a busy scene. Each one was deeply impressed with the exigency of the moment, and exerted himself to the utmost. Boxes, barrels, cans, &c.,

1872. October. were thrown over the side with extraordinary rapidity. Men performed gigantic feats of strength; tossing with apparent ease, in the excitement of the moment, boxes which at other times they would not have essayed to lift. Forward, coal and the more substantial provisions and bags of clothing were thrown overboard; abaft, the lighter boxes of canned meats and tobacco, with all the musk-ox skins and fresh seal-meat, were transported to the floe. The cabin was entirely emptied; beds and bedding, clothes, and even ornaments, were carried out. Messrs. Bryan and Meyer placed upon the floe the boxes containing all their note-books, observations, &c. This was done deliberately and after mutual consultation. The boxes were too large to be carried about, and, in the actual condition of things, the floe appeared to be, decidedly, the safest place. They were taken far back and placed with the provisions and clothing.

Mr. Bryan's box contained, together with his private letters and papers, the following public articles:—

Note-books containing astronomical and geodetic observations made by Captain Hall;

Observations made with the transit-instrument: for time; and for longitude, by 12 complete sets of moon-culminations, and by observations on Jupiter's satellites;

Observations made with the alt-azimuth instrument or

Casella theodolite: for latitude of different places; for time; for declination of magnetic needle; and for surveying purposes; 1872. October.

Observations made with the sextant: for position at different places; for the latitude of Thank-God Harbor by double and circum-meridian altitudes of the sun and stars at both culminations; for time at Thank-God Harbor by sets of single and equal altitudes of sun and stars, a very large number; for longitude of Thank-God Harbor by altitudes of the moon, and by over 300 lunar distances; for declination of magnetic needle by solar bearings; for determining the height of twilight arch and the diameters of halos; and for surveying purposes;

Observations with the magnetometer: for variation of magnetic declination, comprising hourly observations extending over five months, and six-minute observations during three term-days in each month; for absolute declination, by reference to terrestrial objects whose azimuth had been determined by solar bearings; and for absolute intensity;

Observations with the dip-circle: for magnetic inclination in several places, including 23 sets at Thank-God Harbor; and for relative intensity by Floyd's needles;

Observations with the prismatic compass: for magnetic declination; and surveying purposes;

Note-books of surveys, and the daily chronometer comparisons;

1872. October. Two large books containing a very full daily record of events;

Several books containing detailed accounts of important events;

A large botanical collection;

Several choice zoological and mineralogical specimens.

The following list of the contents of Mr. Meyer's box is taken from his report to Brig. Gen. A. J. Myer, Chief Signal-Officer of the Army:—

Private letters and documents;

Record of meteorological observations reduced and corrected;

Books of comparisons for the correction and verification of meteorological instruments and observations;

Table of relative humidity, and dew-point for indications of the wet-bulb between 0° and — 50°;

History of the expedition in journal form;

Meteorological journal containing a detailed record of occasional observations and short discussions of marked meteorological phenomena;

Astronomical and geodetical observations, including surveys of all land discovered and corrected;

Observations on magnetic declination at numerous localities;

Observations on horizontal intensity of magnetism at Thank-God Harbor by theodolite-magnetometer; **1872. October.**

Botanical collection of plants between latitude 81° 26′ N. and 82° 07′ N.;

Topographical map of Thank-God Harbor and Polaris Bay, secured in a tin cylinder.

The pendulum-observations, which properly belonged to Mr. Bryan's work, having been recorded by Dr. Bessels, were fortunately kept by him, and not put out on the ice.

The Esquimaux women and children took refuge on the floe. It should be mentioned, however, that Hannah, after taking out the things from her room, worked like a man, proving herself equally capable in handling heavy boxes.

The little bilge-pump in the passage-way had been kept going, but the leak was increasing, and it could no longer be made to suck. Captain Budington at once ordered steam to be raised in the little boiler. It was dangerous to be at work down in the fire-room, when the ice was threatening to crush in the vessel's side above them; but the engineer department did not now shrink from danger—it never had done so.

The two boats were lowered, and, with the scow, were placed on the floe. The pressure had now become so great that the great floe itself had cracked in several places, and the vessel was gradually breaking off

1872. October. its edge and bearing down the pieces. Many articles had been thrown in a heap near the ship, and it was found that some of the lower things in the pile were dropping through between the vessel and the ice. It was also seen that should the ship be cut through and sink, many, if not all, these articles would sink with her. A call was therefore made for men to carry these articles to a safer place on the floe. There was no special designation for that duty; but Captain Tyson, taking several persons with him, at once entered on it. After laboring about one hour and a half, the decks were cleared and the men on board ship had finished their work. At 9.30 p. m., by some change in the ice, the starboard side was again clear; the vessel was free from pressure, and the cracks in the floe began to open.

Unfortunately, two of these cracks ran through the places where the stern anchors had been planted, breaking their hold. The wind, still strong, now drove the vessel from the floe, and, the anchors dragging under the strain, she swung round to the forward hawser. The latter slipped, and the vessel was carried rapidly away from the ice. The night was black and stormy, and in a few moments the floe and its precious freight could no longer be seen through the drifting snow. Before the separation, it had been noticed that the floe was much broken on its edge; that the provisions and stores were

separated from each other by rapidly widening cracks; that the men also were on different pieces of ice; that active efforts were being made to launch boats in order to bring the scattered people together. Several men were seen rushing toward the ship as she was leaving, but they failed to reach her. The voice of the steward, John Herron, was heard calling out, "Good-by, Polaris!" **1872. October.**

XVIII

CHAPTER XVIII.

As soon as the floe-party disappeared, Captain Budington called all hands to muster, when it was found that fourteen men remained on board: 1872. October.

Captain, S. O. Budington;

First mate, H. C. Chester;

Second mate, Wm. Morton;

Chief of scientific corps, Dr. Emil Bessels;

Astronomer, R. W. D. Bryan;

First engineer, E. Schumann;

Second engineer, A. A. Odell;

Carpenter, N. J. Coffin;

Firemen, J. W. Booth, W. F. Campbell;

Seamen, J. B. Mauch, N. Hayes, H. Siemens, H. Hobby.

This remnant of a crew, so suddenly reduced, gazed on each other for a few moments in silence—when the order was given to station the lookouts; the duties of the ship were resumed.

1872. October. The impression was that both the rudder and the propeller had been injured, and without the former it was useless to make sail; there was, as yet, no steam. The wind drove the vessel with rapidity through the water, which, except for detached pieces of ice, seemed to be clear; the sea was rough. Several bergs were passed in safety, but not without increased anxiety when it was remembered that the boats had been left on the floe. This was a period of deep gloom and of conscious helplessness, not unaccompanied, however, by that trust in Divine Providence which never forsakes the breast of an able seaman.

A few moments after the separation, one of the firemen who was below getting up steam, reported that the vessel was leaking very fast. Mr. Schumann was sent to make an examination, and his report was very alarming. The water was pouring in so rapidly that he feared the fires would be put out before steam was raised to work the pump; all hands were at once sent to the large main-deck pumps. A few pails of hot water from the boiler started the four pumps. "Now work for your lives, boys," said the captain; and all worked with a will; continual streams poured from the pumps. The scuppers, even when cleared, were not sufficient to carry off the water in which the crew were standing—insensible to the exposure because working for life. Frequent soundings of the

well showed that the leak was gaining; the engineers and firemen were urged to their utmost. Everything combustible, including seal-blubber, which happened opportunely to be at hand, was thrown into the fire. They worked as they never had worked before; for they knew very well that if the water rose to the fire-plates all would be lost. After an hour and ten minutes of the severest labor, the welcome word was passed that steam was up and the steam-pump at work; this came not a moment too soon. So rapidly had the water gained that, at the moment the pump commenced to work, it was lapping over on the floor of the fire-room. In a few moments more it would have reached the fire itself, and the history of one part of the crew of the Polaris would have ended. The steam-pump, however, did good service, and rapidly gained on the leak, so that all anxiety was for the time removed. **1872. October.**

The Polaris continued to drift along until toward midnight, when she ran into posh ice, and her progress was stayed. The wind died away and all was quiet; the moon began to show herself more frequently, and a few stars were seen here and there. The men gave themselves up to broken slumbers, which, under the circumstances, were the only rest possible. The officers (their own bedding being on the floe) sat up in Mr. Chester's room, and discussed the probable fate of their absent

1872. October. companions, and their own, by no means brilliant, prospects.

The morning of the 16th was calm and clear. At daylight, the first object was to determine the ship's position. The vessel lay in young ice about twelve inches in thickness, not far from the eastern coast. Upon studying the land carefully, it appeared that she was about halfway between Littleton Island and Cairn Point, and not more than five miles from the coast, opposite the head of Life-Boat Cove. Since there was only coal enough to keep fires alive for a few days, it was evident that the vessel must be abandoned. The foresail was unbent and cut up to make bags for coals and bread.

Mr. Chester was sent to the crow's nest to look for the party left on the ice. He examined everything carefully with a good glass, but could see no living creature. He thought he saw some of the provisions and stores on a floe, out toward the middle of the strait, about four miles from the ship; others who saw the same thing felt sure that it was black ice, or stones, or *débris*. Henry Hobby looked also for the missing people, but could see nothing of them. This was variously accounted for; first, by supposing that the vessel had drifted entirely out of sight; secondly, by supposing that she was concealed by the land. Mr. Chester says in the log-book: "The large floe that our party were on must have stopped to the south

"of Littleton Island, and very near the east shore of the straits." 1872. October.

About 8 a. m., a breeze sprang up from the N. E., breaking up the young ice, and making lanes of water leading to the shore. At once the captain decided to take advantage of these openings, and get the ship as soon as possible secured to the land. When it was proved that the ice would bear, Hermann Siemens was sent out to plant anchors for warping ship. The little boiler contained steam enough for a few revolutions of the engine, and once in a while it was used to help the vessel round a point. All were agreeably surprised to find that the propeller was in good condition, and that the rudder, although injured, could still be relied upon. When the wind strengthened, the jib, main-sail, main-spencer, and the stay-sail were hoisted, and the vessel made good way.

Thus the ship finally reached the land, where she was secured with heavy hawsers to large grounded hummocks; she lay with her starboard side toward the beach. After her stern-post took the ground, it was impossible to get her farther up. On the ebb, she heeled so much that the water came half-way up the bulwarks.

The captain and Dr. Bessels took refuge for the night in Mr. Chester's room. Morton, Bryan, and Mauch chose the forecastle, where they found some blankets left by the

1872. October. men who had gone on the floe. The whole company was badly off for clothes, having none but those on their backs. A few refuse pieces of clothing were found, and added to the scanty store. The sentiment of relief and gratitude for the escape from their recent perils was deep and universal.

Early on the morning of the 17th, the crew were set to work making preparations for leaving the ship. Toward noon, it being very high water, an attempt was made to get the vessel nearer shore, and more head on; the grounded ice-masses were, however, so close together that little could be done. During the morning, two blue foxes were seen. The sun at noon did not show itself above the mountains. It had been seen on the 16th—the last time for several months.

At night, by invitation of Captain Budington, those who had lived in the forecastle, moved with their bedding into the cabin. The eating was done in the lower or berth-deck cabin; there were two tables. At low tide there was an opportunity to examine the leak. The whole stem was gone below the six-foot mark; one or two planks, still attached, were bent back on the port side. The captain was greatly surprised that the vessel did not leak more, and could only explain it by the many thicknesses of timbers in the bows, which were solid for some distance from the stem.

On the 18th, no pack-ice could be seen to the southward and westward, the N. E. gale having driven it away. The day was warm and pleasant, although overcast and foggy; a little snow fell in the afternoon. 1872. October.

The crew were employed in taking things to the shore, about 400 yards distant. The two yards, the two booms, the two gaffs, the two top-masts and their rigging, were taken down, and hauled to the shore; the sails, having previously been unbent, were made up ready for transportation. The vessel was further secured by two additional hawsers. A blue fox was seen near the land, and two ravens flew over.

The 19th was a day of calm, with a little snow. At the moment of going to work, the sound of dogs was heard, and it was at once thought that those of their company from whom they had been separated, were returning. The excitement was intense; some looked out into the straits, others to the south, and others toward the land, in the direction from which each imagined the party was coming. In a few moments, two figures were seen on the land, making a loud outcry; but, on their approach, there was great disappointment in finding that they were only Esquimaux.

They soon reached the ship with their small sled, the runners of which were shod with bone, drawn by nine dogs. They were dressed in dog-skin jumpers and bear-

1872. October. skin trousers. Captain Budington, who had had some experience with Esquimaux, and could make himself intelligible, at once addressed them. They managed to find some words in common, which, aided by signs, enabled them to carry on quite a conversation. They said they were from Etah; that they had smelt the smoke from the vessel, and had come over the land to see what it was. They had heard nothing and seen nothing of the floe-party. Their names were A-wah'-tok and Mi'-ouk. They are mentioned in Kane's work, and after a little while they seemed to remember Morton. They expressed their willingness to help in transporting articles to the shore.

They were very much surprised to see the number of seals hanging in the rigging and the musk-ox skeletons on the deck, and exhibited great wonder and interest upon being shown the cat and the live lemmings—animals which they declared they had never seen before. They helped during the day in landing stores.

It having been decided that it would be impossible to remain in the vessel, Mr. Chester, assisted by Booth and Siemens, began to build a house upon the shore. With the yards and other materials, a square frame, 22 by 16 feet, was put together. A corresponding frame of lighter stuff made the roof-plates, and was supported by planks, 6½ feet high, forming the sides of the house. When in

the afternoon work was stopped, the house was framed and the four sides boarded up. **1872. October.**

The Esquimaux left the Polaris early on the 20th, promising to return with some of their tribe to assist further in transporting to the shore the contents of the ship. The weather was mild all day, making it very pleasant for work, notwithstanding a light snow was falling. The crew was again employed in hauling stores to the shore.

The work on the house progressed rapidly. A ridge-pole was secured eleven feet above the floor, and rafters were placed at convenient distances. There being no suitable lumber for covering the roof, two sails were stretched over the rafters. Before night the floor was nearly laid.

While at work during the day, Dr. Bessels twice fell through cracks in the ice. Mauch tried it once; he was not very well provided for such experiences, having only one suit of clothes; it was some time before a change of raiment could be found for him.

Early on the 21st, six Esquimaux came with five teams of dogs. They evidently had come to work, and they did work hard all day, proving themselves a good-natured set of fellows, full of fun, and ready at all times for a laugh. The crew loaded the sleds at the ship and unloaded them on shore.

It was lively sport with the teams hastening back and forth from ship to shore, and the loads they carried

1872. October. were remarkable. Four of their dogs would trot off gaily with a weight which four of the ship's crew could scarcely move. The difference in the sleds, however, must not be overlooked; the Esquimaux sleds were light and shod with bone, slipping easily over the ice, while the sled used by the Polaris men was heavy and shod with iron. At first, all the smaller sleds having been left on the ice, the large sled, made by the carpenter the winter before for transporting boats, was used; this sled, however, proved to be unwieldy, and was sawed in two, but even the half was too heavy.

The building of the house had advanced so rapidly that the bunks, in two tiers, six on each side, were now put up. At the end opposite the door were two other bunks, one for Captain Budington and the other for Mr. Chester. Nearly all moved over and slept in the house that night. The captain showed the Esquimaux a number of whaling harpoons and lances, telling them that if they stayed and helped him until everything was out of the ship he would give them many presents. They seemed pleased, and promised to render good service. Captain Budington says in his journal: "We have taken stock of our ammunition, and find that we can avail ourselves of about eight pounds of powder, which some of the men had stored away in their chests and powder-flasks. This is all we have on board, the powder-can having been also put off on the ice

"during the fearful night of the 15th; also all our Sharp's cartridges, except some open [loose] ones which were found amongst the men's things. One box of musket-cartridges we have, and plenty of shot and lead; also several shot-guns. In fact, we are not altogether as bad off as we first supposed, and the only thing that we are short of is clothing. This, if we cannot get any game, we may feel considerably before spring comes on." **1872. October.**

On the 22d, the natives continued to assist, and a great deal was removed from the ship. The galley was placed on the southeast corner of the house, and the small stove was also taken over and put up. The house faced a little to the west of southwest.

Articles could be sledded to the house at or about high tide only. At low tide, the ice of the bay sinking, there was left a huge crack between it and the ice-foot, which it was impossible to cross with a sled, and at this crack, there was a difference of level of between five and six feet. But the work was not stopped on account of these obstructions; the sleds were unloaded near the crack. Every one moved over and slept in the house, with the exception of the two engineers who still kept the engine moving. Reindeer tracks were now seen near the ship.

On the 23d, Mr. Chester extended the house to provide a store-room equally as wide, and nearly as long; it was built on the southwestern end, and inclosed

1872. October. the galley. The door being at the same end, the store-room answered the purpose also of an ante-room, keeping out the weather. The two engineers came over with the cat, leaving on the Polaris at night only the firemen and the Esquimaux. Their work being finished, the Esquimaux returned to their homes early on the 24th, having received many presents. During the day, the bunkers and bulkheads below deck were torn down, and every useful thing was carried to the upper deck. At 6 p. m., the pump was allowed to stop, and thus the final act of abandonment was executed.

On the 25th, it was discovered, on examination, that there were but six tons of coal remaining. A great deal of lumber, however, had been brought on shore, and more could be obtained from the wreck during the winter. The water had risen during the night five feet above the fire-room floor.

Mr. Bryan with Mauch went hunting; they crossed to Littleton Island, but saw no game. Dr. Bessels followed them, with the same ill success; upon his return, however, he shot a blue fox near the house.

This day an Esquimaux arrived at the house with his family, consisting of his wife and two children, a boy of four, and a girl of about two years of age. They lived at the head of Foulke Fiord. The captain at once noticed

that the woman had her face tattooed, and said that she must have come from the West-land, as tattooing was a custom which did not obtain among the East-land natives. After some conversation, the captain ascertained that his surmise was correct. A party in an oomiak and five kyaks had crossed over, four or five years before, and these were the only survivors. They had introduced the use of the bow and arrow. Kane and Hayes particularly mention that the Smith Sound natives did not use that weapon. The woman was very intelligent and readily understood the captain. 1872. October.

On the 26th, the water had risen in the vessel to within three feet of the upper deck. A very severe wind from the N. E. sprang up, but was not much felt. The weather fortunately had remained fine until the party from the ship had become established, and had made themselves comfortable in their new quarters. They could not, however, help speculating upon the fate of their late companions, wondering if they were exposed to this storm with no shelter. The general opinion was that Tyson had been able to effect a landing with his men, somewhere to the south, and that he would probably use his dogs, sleds, and boats to travel up the coast and rejoin the main party.

A large number of Esquimaux, comprising the whole population of Etah, consisting of nine men, three women, and eight children, now made their appearance. Most of

1872. October. the men had been on board the vessel before. They could give no information respecting Tyson and his people, notwithstanding the many and pressing questions put to them. These natives brought some walrus meat.

Mr. Chester started off on a deer-hunt with the Westland native and his family. Hobby shot a blue fox near the house. The Esquimaux attempted to pass the night in the ship, but when the vessel heeled over at low tide the women became so frightened that they would not stay on board; the men built a snow house, where they all passed the remainder of the night.

On the 27th, lumber was piled up near the house for winter use. Quite a stir was occasioned by the discovery of a man running on the ice of the straits far from land. The twilight was too faint to distinguish objects clearly; but he ran like a white man. The suggestion that it was one of the ice-floe party led to great excitement. Several started out to run and meet him, and others prepared to run; but after some time it was discovered that it was an Esquimaux, who had gone out in search of food for his dogs. This news was carried along the line of runners, and brought them all back, except Morton, who was out of hearing, and continued on until he reached the man. The Esquimaux from Etah were allowed to pass the night on the floor of the house, presenting a motley but interesting group.

In the evening, a faint aurora was seen. The wind on the 28th, was so strong that little outside work could be done. The Esquimaux left for their homes. 1872. October.

At 9.30 a. m. of the 29th, Mr. Chester returned. He had been to the hut of the Esquimaux with whom he went, at the head of Foulke Fiord, and about one and a half miles from Brother John's Glacier. He had seen two reindeer, but had not been able to get within rifle-shot. The wind during his absence had been so strong that he could not venture far from the igloo. The lowest temperature of the season, —4°, occurred to-day.

On the 30th, more lumber was brought from the vessel, and the forge and anvil were set up in one corner of the store-house. In the evening, Mauch and Siemens each shot a fox; Hobby shot three.

On the 31st, Captain Budington sent a party, consisting of Mr. Chester, Dr. Bessels, Noah Hayes, and the carpenter, with pick and shovel, to McGary Island to look for the boat left there by Dr. Hayes, and to see if it could be used. They failed to find any trace of the boat, which was probably hidden in the deep snow.

Mr. Bryan with Mauch and Siemens took a tramp over the land to the northeast; they killed no game, and saw only two foxes and some deer-tracks.

1872. November. On the 1st of November, a heavy, dark cloud was seen over the straits, hiding the western land and indicating open water. Two Esquimaux families came over from Etah; they were driven from home by want of food, having been compelled to kill some of their dogs. Three foxes were shot near the house.

The meteorological observations were recommenced; Mauch's watch was from 4 p. m. to midnight, and Dr. Bessels observed for the remaining sixteen hours.

On the 2d, a severe gale from the S. W. prevailed, with an exceedingly heavy snow-drift. The Esquimaux women were engaged in making a few mittens and other garments out of skins that happened to be on hand. On the 3d, Mr. Chester and the carpenter started out hunting, but were unsuccessful, although one deer was seen. On the 4th, a small building for the transit-instrument was erected about thirty yards southwest of the house.

It began to be disagreeable to have so many Esquimaux night after night sleeping on the floor, and a tent was set up, made out of a sail, in which they passed the night; but they did not like it. On the 5th, Mr. Chester and Noah Hayes went up the coast with one of the natives on a hunt, but saw no game. Hobby shot a fox. On the 6th, a white fox was caught in a steel-trap. The same day, Mr. Bryan and Schumann set out with two of the natives, with their families, for Etah, on a hunting excur-

sion. As the ice of the straits was not firm enough to bear them, they were obliged to cross the land. After ascending a high hill, they passed in a southeasterly direction across an undulating plain, and, entering a tortuous ravine, were led to the shore of Foulke Fiord. The land was high and steep, and its descent was not effected without danger. Reaching the settlement of Etah, they found that it consisted of three huts built of stone and turf. The two larger huts were the joint property of two families which were blood-relations. The first was occupied by A-wah′-tok, one of the men who had first visited the vessel; his wife's name was Ke-shan′-gua, and he had two sons, mere lads, A-ning′-a and Kes′-su. His daughter, Mak-shan′-gua, was married to Neu-in′-nea, and had a young daughter; she lived with her father. **1872. November.**

The second hut was owned by Shu′-kok and Im′-me-nah, who had married very pretty sisters, A-nul′-lok and A-ma′-mie. Shu′-kok, or, as he was sometimes called, Nanook′-ie, had two bright little boys, Mi′-ak and Shu′-loo. Im′-me-nah had a girl and a boy, Nel-le′-ka and Koh-ket′-sha. The third hut was the property of Mi′-ouk, who occupied it with his wife, Six′-se-a, a young son, Ko-lus′-suk, a little daughter, Ma-kip′-su, and a baby boy, Charley—so named by some of the crew. The hut at the head of the fiord was inhabited by the West-land family. The man's name was E-took′-a-jeu, nicknamed Jimmy; his

1872. November. wife's, E-val'-lu; his little boy's, Pun'-e-pa; and his little girl's, Mun'-ning. Besides these, there were staying in the huts two young couples, E'-nu and his wife, Mun'-ny, and A'-koo and his wife, Koosh-oo'-e-tah; Ma-jet'-sha, his wife, A'-ma, and daughter, E-nel'-look, and an old widow woman, Ka-rush'-uck. Messrs. Bryan and Schumann passed the night in Shu-kok's hut, some of his Esquimaux friends going into one of the other huts to make room for them. The next day, in company with Shu-kok, they went after deer. They saw several, but did not succeed in getting a shot. The following day they returned to the house, three Esquimaux men, with their teams, accompanying them.

Captain Budington says, in his journal of the 7th: "Two natives left us this morning early, before breakfast, carrying one of our Sharps' rifles with them, which one of the men had put on the sled, intending to accompany it. Henry Hobby left us after breakfast, following the sledge-track to Etah, but returned to the house in the evening, completely tired out from his long tramp. He reached Foulke Fiord after the darkness had set in already, but there lost the sled-track, and, not being able to find the huts, he hurried to get back again. On this excursion, he saw three deer; fired at one of them with a navy pistol, the only weapon he had, and missed." In the evening, Captain Budington shot a blue fox; and, on the 8th, Hobby shot another. The captain cooked his, and it

was highly relished, notwithstanding the previous prejudice against it. Heretofore, fox-meat had always been given to the natives; it was now determined by the ship's company to keep it for themselves. 1872. November.

On the 9th, Shu-kok returned to Etah. It was a severe day, the strong wind making the traveling very difficult. Campbell accompanied him, notwithstanding the earnest remonstrances of all the others. In the afternoon, the natives in the house furnished the company a good deal of amusement by showing their tricks, and by dancing and singing, using a tin pan as a drum. Jimmy was dressed up in a white navy-frock and round hat, and danced a regular break-down to the music of Mr. Chester's violin. Every one was convulsed with laughter.

Two natives, A-wah-tok and his son-in-law, Neu-in-nea, came from Etah, traveling for the first time on the ice. They went out, the next day, walrus-hunting, to the edge of the floe which was not more than a mile off, and brought back part of a large walrus on a sled; the remainder they afterward carried home to Etah. A blue fox was also killed.

The crew did not fail to remember that at home it was the day for the election of President; they polled their votes accordingly, all being allowed to vote except Dr. Bessels, who had not been naturalized.

On the 13th, there was a very severe storm from the

1872. November. S. W., accompanied by a blinding snow-drift, which did not add to the comfort of those who were obliged to be abroad; yet E-took-a-jeu and family came from Etah, without seeming to mind the weather. A blue fox was killed during the day. A good deal of moisture condensed and froze on the canvas covering of the house, and when the outside temperature rose, or there was a hotter fire than usual in the stove, it dripped down into the berths and on the table. To remedy this, the carpenter tacked boards up, so as to receive and turn off the water.

The Esquimaux now began to pass back and forth between their settlements and the house so frequently that it would be tedious to give a record of their movements. The West-land family built a snow house near the ship, with the intention of remaining with their new friends all winter.

On the 14th, though it was cloudy, no difficulty was experienced in reading the smallest type. Mr. Chester was busy copying his log into a smaller book, which would be more easily carried, while the original might be *cached* near the house.

On the 19th, a snow wall was built over the door to protect it from drift. Hobby shot two foxes on this day, and one on the day previous.

Mauch and Siemens, on the 21st, went to Littleton Island, in pursuit of reindeer, but found none. Diamond

type could still be read at noon. The natives continued to come and go in great numbers. **1872. December.**

On the 25th, Nanookie, with Jim's assistance, finished an igloo for his family, on a snow bank about a quarter of a mile S. E. of the house.

On the 27th, more natives arrived from Etah. They had been suffering from want of food.

On the 30th, the barometer rose to $30^{in}.6$. The highest temperature for the month had been 19°.8, Fahrenheit; the lowest, —17°.1; and the mean, about 1°.9.

The supply of coffee being exhausted, rye was used in its place. Miouk arrived from Etah, with a sad story of the wants of the people there; some had already moved south to better hunting-grounds, and others intended to follow.

The strait continued open, a dense water-cloud hanging over it. On the 3d, the open water was not more than one and a half miles from the ship. The noise made by the crushing and grinding of the ice was loud and long-continued. The crew rejoiced that they were not exposed to the perils of the floating pack. The evening before, a faint aurora had been seen.

The Esquimaux endeavored to go south, but were unable to get round Cape Alexander, on account of the

1872. December. open water. Neuinnea built an igloo, and occupied it with his family. During the next few days, twenty-one Esquimaux remained at Polaris house, some sleeping in igloos, but most of them staying in the house.

On the 7th, a serious violation of discipline occurred—the only one during the voyage. An engineer and a seaman quarreled about the possession of a shelf, and made use of threatening language and gestures. Captain Budington, by a prompt and efficient exercise of his authority, restored order.

On the 12th, Hobby shot a fox near the house; many more of these animals would have been killed but for the presence of their enemies, the Esquimaux dogs. On the 13th, five families of Esquimaux were living in igloos near the house, and taking two meals daily with their white friends. They comprised five men, five women, and seven children. In addition to these, there were always two or three casual visitors. On the 14th, Sip'-su and his wife, A-man'-a-me'-lia, came from the south—from Northumberland Island, as nearly as could be ascertained—to tell their Etah brethren that there was good hunting below, and that the Esquimaux there had an abundance of walrus and seal-meat. Captain Budington inquired diligently of Sipsu for some tidings of the ice-floe party. If they had succeeded in landing on the coast, these natives would doubtless have seen them.

To hear nothing of them was a great disappointment, and no very strong hope of their safety could now be entertained. **1872. December.**

On both the 20th and the 21st, the height of the twilight arch was measured by Colby's horizon-instrument. No very decided results could be obtained, as it was extremely difficult to tell exactly where to point the instrument. Many measurements were made by different persons, the results varying from 8° to 10°. Some very coarse print was read on the 21st.

Budington says in his journal: "There is a considerable difference with us between midwinter of this year and the last. In Polaris Bay, we only saw a small portion of the twilight arch for two hours, while here we see the twilight for six hours. The arrival of this day when the sun will gradually return to us, we have expected with great impatience. Although the health of our company is the very best, and will, I trust to the Almighty, remain so, the uncertainty about the fate of our comrades on the ice throws a gloom over our party which cannot be entirely banished. The fact that we did not hear of them through the natives makes me believe that they remained on the floe. I can only hope they saved enough provisions to pass the winter."

Miouk made many trips to the house to beg bread and blubber; his family remained at Etah in a starving

1872. December. condition; he was compelled to kill four fine dogs to supply their wants.

Mr. Bryan says in his journal of the 24th: "'Tis Christmas-eve, and we are all thinking of our homes, but none, apparently, home-sick. There are but three families, comprising ten persons, staying with us at present. We are constantly having visitors. I took quite a long walk with Mr. Chester to-day. It has been very mild indeed. There is a vast difference in the intensity of the twilight here and at Thank-God Harbor at the same season of the year. We could see very well to-day to pick our way over hummocks and cracks. We are jogging along slowly, exceedingly glad that the turning-point of the winter has passed, and looking hopefully forward to our spring work; suffering, however, daily from anxiety as to the fate of our comrades. We always hope for the best, but we have little grounds for thinking that they are safe."

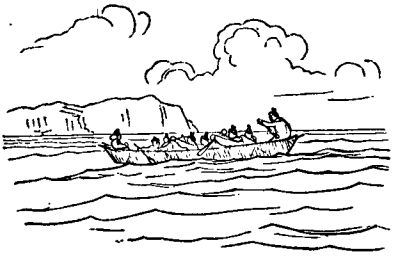
The domestic life in Polaris house was simple enough; each day was an almost exact counterpart of the preceding. Breakfast was taken at 9 a. m., before which hour few got up. Two successive tables were set, there not being room enough to seat the whole at one time. The morning was employed in observations, in cleaning fire-arms, in writing journals, or in ordinary occupations. Mr. Chester was for some time engaged in making different

articles from the ivory of the walrus. Dinner was served at three p. m.; there was no regular supper. Chess, checkers, dominoes, and cards constituted the principal amusements. Ten was the hour for turning in. During the day, the cat was very shy, and kept herself the greater part of the time in the captain's bunk; at night, she came out and frolicked through the house. **1872. December.**

Captain Budington took every opportunity to gather information from the natives, who became more communicative when better acquainted. E-val'-lu seemed to possess the best faculty of making herself understood; her husband looked at her with admiration while she was talking. Through her, the captain learned some particulars of that company from the West-land, of which she and her husband were a part. Her story was that they had crossed over to the spot where Hayes had left his iron boat, which they found stove and useless; they took up everything, including the oars, and then passed over to the mainland, where they found Dr. Hayes' observatory. They stayed about there several days examining the strange things which they discovered. While sleeping in the house one night, they dropped some fire into a powder-cask and were blown up; four or five of them being killed, among them Jim's father. The survivors of the disaster returned to their native land, leaving E-took-a-jeu.

1872. December. The steward, Booth, was laid up on the 31st, with swollen wrists and ankles, and showed every sign of the scurvy.

The highest temperature during December was 15°.0 Fahr.; the lowest, —27°.5 Fahr.; while the mean was about —8°.5 Fahr.



XIX

CHAPTER XIX.

The twilight had now so much increased that on the 1st, the noon observation was made without artificial light. The straits continued open, and, on the 3d, the noise from the grinding ice resembled continued thunder. The coal diminished rapidly, and it was necessary to economize; the captain ordered the fire in the little stove to be put out at 9 p. m. This obliged Dr. Bessels to make his observations from midnight to 6 a. m. in the cold; his enthusiasm supplied sufficient heat. This practice of doing without the fire was, however, continued only for a few nights. As an additional saving, the captain determined to dispense with the galley-stove, and to cook only one meal a day, and that upon the small stove, but this piece of economy was necessarily abandoned, on account of the galley-pots not fitting on the small stove.

1873. January.

On the 11th, a party of eight men, two women, and one child, drawn by six teams of dogs, arrived at the house from some settlement near Northumberland Island.

1873. January. The people were in good condition, and had forty or fifty very fine dogs. Prominent among them was Ka-lu-ti'-nah, mentioned by Dr. Hayes. They were also accompanied by an old woman, At-koot'-ta, or Nu-li-a-jesh'-shu, the widow of Metek, one of Dr. Kane's visitors; she seemed after a while to recognize Mr. Morton. On the 12th, the thermometer fell as low as —41°.5. On the 20th, non-pareil type could be read at noon. This day the coal gave out, and the wood which had been stored in the autumn about the house, was used in its stead. A raven was seen flying near, and, as one had been seen late in November, it was supposed the bird had spent the winter in the neighborhood. The straits still continued open, and the grinding of the ice occasionally made fearful noises.

On the 22d, the edge of the floe was not more than two miles off. The natives went out several times to hunt for walrus, but were unsuccessful. A fox was killed near the house; Dr. Bessels and Hobby both fired at it, and, some time afterward, Miouk found it dead; but the cause of its death always remained a mooted question.

On the 24th and the 26th, the instruments indicated a temperature below the freezing-point of mercury, but the mercury, though exposed, did not freeze.

On the 27th, all the wood that could be found near the house having been used, it was necessary to go over to the ship. Great care was observed to leave untouched

that part of the vessel from which wood for the boats was to be taken. Since the iron boat of Dr. Hayes could not be found, the sole dependence of the party rested on boats of its own construction. Every nail and screw now found was carefully preserved, there being none in store. The Polaris had been so faithfully built that it was no easy task to break her up. It was necessary to reduce the wood to splinters to take it off. In carrying this wood to the house on the 29th, it was found that the high tide had overflowed the ice and raised the water up to within twelve paces of the door. The effect of a residence of two winters in the Arctic regions was now apparent in the diminished strength of the people, who were easily fatigued by slight labor. **1873. February.**

During January, the highest temperature recorded was —8°.5; the lowest was —41°.6; while the mean was —27°.8.

The whole of the second day was occupied in tearing down the wheel-house; on the next day, the wood was taken to the house, making fuel enough for two days. The heavy northerly gales had kept the ice in motion, and constantly increased the extent of the open water. The edge of the floe was not more than a mile distant from the vessel, and the west side of McGary's Island was washed by the sea.

The walrus liver last brought by the Esquimaux and

1873. February. eaten by the ship's company, produced a dysenteric effect, but, at the same time, removed sore and diseased gums and all the other symptoms of scurvy with which many of them had been troubled.

On the 5th, Mauch shot a white fox found running over the vessel; two ravens were seen.

On the 6th, at meridian, a distinct orange color was discernible over the mountain-tops toward the south.

On the 7th, the bowsprit was sawed off and taken to the house for fuel. One solitary raven was noticed making daily visits to the house. A window was placed in the roof of the building, and during several hours of the day the oil-lamps could be dispensed with. Mauch and Hayes took a tramp over the plain to the east, skirting the mountain-range, and seeing fresh tracks of three ptarmigans.

On the 9th, a S. W. gale completely filled up the straits with ice, and for the first time the western coast was visible; every day since the middle of October, the time of landing, it had been obscured by the water-cloud. The next day, however, a N. E. gale again cleared out the ice, and the water-cloud resumed its place. All the natives left for their southern hunting-grounds during the latter part of January, except Jim and his family, who proved to be very useful. In severe weather, Jim always procured the ice, and in many other ways rendered good

service. His wife, Evallu, did a good deal of sewing, and made many garments out of skins. Their little children were continual sources of amusement, and many pleasant hours were spent in playing with them. The little girl was a general pet, making many friends by her pretty face and affectionate disposition. Some of the crew took pleasure in teazing the Esquimaux, and did not recognize in them a common companionship; but, at the same time, the natives were good-natured, and made themselves useful and agreeable to those who treated them with kindness. **1873. February.**

On the 17th, the tops of the mountains to the N. E. were illuminated by the sun's rays. For several days, the storms had been so severe that it was not safe to venture on board the vessel after wood. The forecastle-hatch, which had been set up on shore for the use of the transit-instrument, was, therefore, taken down and converted into fuel.

On the 20th, Shu-kok and Im-me-nah, with two new natives, arrived from the south, bringing a large quantity of walrus meat, which was highly relished. The same day, the foremast was sawed through near the deck, and used for fuel. The barometer, which had been very high all day, toward evening rose above 31 inches. The atmosphere was clear, and there was no wind; the temperature went down to —43° Fahrenheit. Mercury remained in a solid state for ten hours.

1873. February. On the 21st, another window was put in, on the other side of the roof. A native came on the 22d, and another on the 23d, both bringing with them some portions of a walrus liver, which is the choice part of the animal; this attention was fully appreciated.

On the 25th, a window was placed in the store-room, and the sawing of the wood was done under shelter. The open water could be seen about two miles from the vessel. The water-cloud continued, however, to shut out all view of Ellesmere Land. On the 27th, the sun was seen from the deck of the vessel. Dr. Bessels shot a blue fox. On the next day, Jim and Awah-tah came from Etah. Jim had been there hunting for two or three days, and had evidently been very successful; he brought back some walrus meat, and a large piece of liver, which he generously gave to Captain Budington.

Mr. Chester, assisted by Booth and Coffin, commenced the selection of wood for the construction of the boats. He had already settled in his mind the plan of construction, and now entered on his work as deliberately as if he were in a ship-yard.

The parts of the Polaris which furnished the material for the work were the provision-lockers and the ceiling of the main cabin.

During the month, the gales were very severe, and were usually attended with snow-drift. The northerly

winds brought cold weather, and the mercury always rose with southerly winds. The highest temperature was 2°.6; the lowest, —49°.1; while the mean was —26°.7. 1873. March.

On the 1st of this month, a very heavy gale so blocked up the entrance to the house, that Jim had to dig a passage through the drift before he could get in. The sun was seen over the mountain-tops from the house on the 2d. Early in the morning, Awah-tah saw a bear not far from the vessel, and started in pursuit. He had with him his sled, drawn by a train of dogs, and, for a weapon, a spear four feet in length. He remained out all night, and, late on the 3d, returned with the bear's carcass on his sled. During his absence, it was bitterly cold, with a severe gale from the N. E., but he seemed to care as little for the cold as he did for his solitary fight with the bear. When the old man took off his jacket to dry it, his back, marked with the scars of what appeared to be frightful wounds, showed that he had previously had fights with the same enemy. Notwithstanding these wounds and his advanced age, Awah-tah could still throw a spear further and with truer aim than any other man of his tribe.

Four Esquimaux came from the south, paid a short visit, and returned on the 4th. Up to this date, there had been fifty-one different Esquimaux at Polaris House. On the 6th, the water-cloud disappeared for a short time, giving a second view of the western coast. On the 8th

1873. March. and 9th, eight natives arrived, bringing walrus meat and liver; many of them were moving toward the north to hunt bears. On the 11th, Siemens and Mauch, walking over the plain to the east, saw a hare. On the 12th, twilight lasted all through the night.

Dr. Bessels having expressed a desire to make a sledge-journey to Humboldt Glacier, Captain Budington bought dogs of the natives, obtaining for that purpose, by much persuasion and high prices, ten very fine animals.

Among those who came to the house was a man with a wooden leg, named Ar-row'-tah. His story was that, when quite a boy, he was out hunting birds on a hill, and was seriously injured by a stone rolling on his foot. His mother cut off his leg about six inches below the knee. The surgeon of the North Star (1849–'50) made a wooden leg for him, which was repaired and renewed by Dr. Hayes. The one he now had was fitted with an ankle-joint of his own manufacture.

Siemens says in his journal:—

"In the morning (13th) we saw two parhelia, and, in the evening, a cross over the moon. The paraselenæ which we saw had prismatic colors. Bright rays went from the real moon to the mock moons, of which we could see but three, the moon being but a few degrees above the summit of the mountains. These mock moons were in a beautiful circle surrounding the moon."

1873. March.

On the 15th, Campbell went with Jim to a place called by the natives Etah-Wa-tan'-ny; he returned on the 18th, much pleased with the hospitality he had received. This settlement was a little below Sutherland Island, and is marked on the map as Sor-falik. The open water now washed the base of Cape Alexander, so that in their journey they were obliged to mount and cross the glacier that discharges on each side.

The Esquimaux still continued to come and go, spending sometimes one day, and sometimes several, at the house. On the 24th, the number of Esquimaux visiting the house had increased to seventy-seven. On the night of the 30th, there were twenty-three Esquimaux sleeping on the floor of the house; their want of cleanliness made this a trying infliction on the good nature of the men. Additional snow-houses were built for those who determined to remain for some time near their white friends.

Dr. Bessels and Mr. Bryan had been engaged for eight successive nights in making pendulum-observations. In order to be as quiet as possible, they selected the hours from 1 to 5 a. m.

On the 26th, Hobby and Booth went with some natives to Etah-Watanny to hunt deer. By this time, Mr. Chester had finished getting boat-lumber from the ship; all the material he needed was carried over, and neatly piled up not far from the house.

1873. April. Some of the younger members of the company made a base-ball and some bats, and amused themselves near the house playing ball. The ball-ground was the smooth ice of the bay, on the east side of the peninsula on which the house stood. The Esquimaux were very much interested in the play, but could not learn to catch. On the 29th, Hobby and Booth returned, having met with no success in hunting, but having enjoyed their visit among the Esquimaux very much. Dr. Bessels was engrossed in making preparations for his sledge-journey.

The highest temperature during March was —4°.4; the lowest, —47°.0; while the mean was —26°.3.

Nearly every day, the crew were now engaged either in ripping off wood from the vessel, carrying it to the shore, or preparing it for the stoves.

Some of the Esquimaux informed the captain that each year ships were seen near Cape York, and that very frequently they communicated with them; adding that last year some men of the crews landed. On the 4th, Mr. Chester built a work-bench near the house. Dr. Bessels was superintending the preparation of provisions for his sledge-journey; he packed, among other things, 50 pounds of pork, 100 pounds of bread, and 2 gallons of molasses. On the 6th, Jim who had been sent to Cape York, and had been gone eleven days, returned with but

one deer-skin. He brought, however, some walrus meat and liver, which was gratefully received. 1873. April.

On the 7th, the sun was above the horizon at 9 p. m. The southwest gale prevailing during the 7th and the 8th brought back the ice into the straits; the water-cloud disappeared, and the western coast was again seen.

Early on the 8th, Mr. Chester started with Shu-kok on a deer-hunt. He went provisioned for one week, intending to live in a snow-house. In a conversation with Jim, Captain Budington ascertained that there were many Esquimaux living in the neighborhood of Cape Isabella and all along the coast of Ellesmere Land. Jim said that his father-in-law lived there, and that, in winter-time, they frequently communicated with each other, crossing the straits on the ice. He also said that the land was an island, and that he himself had frequently gone all around it; that the Esquimaux called it Umingmung Island, from the number of musk-cattle which are found upon it. From this conversation, it was inferred that *United States* or *Hayes Sound* must turn to the southward and unite with Jones Sound to form an island.

It was also thought highly probable that the Musk-ox Island of which McClintock speaks was, in fact, Ellesmere Land.

On the 10th, Shu-kok returned, bringing two hares which Mr. Chester had killed. Tracks of deer had been

1873. April. seen. Shu-kok left the next morning to return to Mr. Chester.

Early on the morning of the 11th, there was great disappointment at finding that the two hares had disappeared. The natives who slept all night in the house, very innocently said that they had eaten them raw, and that they were *very good*—"*Am-a-su-ad'-ly pe-yuke'.*" During the day, the thermometer rose for the first time above zero, reaching 5°.8. The crew was now employed in getting wood from the ship and in preparing portable bags in which to pack the provisions for the boats; each bag held about 25 pounds.

Mr. Bryan went with Kow-ket'-shu to make Mr. Chester a visit, and on his way met Shu-kok returning with part of a deer which Mr. Chester had shot. He found Mr. Chester in a snow-house a little to the south of Port Foulke. After hunting over the plains some time without seeing any deer, he killed a rabbit and returned to the house.

On the 13th, natives came from the south, and reported the death of Sipsu, who, with his wife, A-man'-a me'-lia, and two sons, had visited the Americans during the latter part of March. He was said to have died of some affection of the chest.

At 10 a. m. of the 13th, Dr. Bessels started on his sledge-journey, with the purpose of reaching Humboldt

Glacier, if possible, and, after examining that, of crossing Smith Sound and exploring United States or Hayes Sound. He took with him Jim and the wooden-legged man, Arrow'-tah, who understood that the doctor wished to go to the western coast, to which he himself had long contemplated a trip in search of a wife. He had been a widower long enough; and, among the women on the east side, there was no one that exactly suited him. They started with two very heavily-laden sleds, provisioned for one and a half months, and well supplied with all necessary instruments. 1873. April.

At 6 p. m. of the 15th, Mr. Chester returned from the south, having met with no further success in his hunt for reindeer. On the night of the 16th, the sun disappeared at 11.30 p. m., but was only hidden one hour; and on the night of the 17th it was above the horizon at midnight.

At 2 a. m. of the 18th, Dr. Bessels returned on account of difficulties with his drivers, who had refused to proceed. Arrowtah had been insubordinate. Dr. Bessels had followed up the coast, and, in order to get around the open water, was obliged to go on as far east as the meridian of Rensselaer Harbor. This was unexpected, since the position and the extent of the water-cloud had encouraged the expectation that the open water would be further from the coast. After getting round the open

1873. April. water, he continued north as far as the observed latitude of 79° 16′. At this point, a line of hummocks was encountered, which the natives refused to cross. He then turned to the northwest, traveling in that direction until he arrived at the western coast, at a point midway between Henry and Bache Islands. Here, also, he met hummocks, which the Esquimaux again refused to attempt. He then ran down the coast to the southward, looking for an opening in the line of hummocks, until he reached the mouth of Baird Inlet. Still finding no passage, and his Esquimaux continuing troublesome, he determined to return and get another man to take Arrowtah's place. He was compelled to retrace his steps to Rensselaer Harbor in order to get around the open water again. The hardship of accomplishing such a distance will be fully appreciated when it is told that the first night was spent in a snow-hut on the ice near Cairn Point, and that during a whole day he was prevented from traveling by a heavy storm. Jim was willing to make another attempt, but Arrowtah positively refused, and the doctor would under no circumstances consent to trust himself with him a second time.

Not discouraged, he determined to make a second attempt; and accordingly, on the 19th, started south to find an Esquimaux to go with him, and also to obtain some more dog-food. This dog-food was walrus-skin, taken off from the animal, with some of the blubber remaining;

it was kept in large rolls, and cut up as it was needed; it was very strong food. On the 20th, Dr. Bessels returned with a piece of dog-food, and with E-win-ok'-shua, whom he had persuaded, by the offer of a large snow-knife, to accompany him. This native had been several times at the house. He was an active fellow, of more than ordinary intelligence, nick-named by the captain "Sharkey", from a resemblance to a Cumberland Gulf Esquimaux, whose traits had led the whalers to give him that name. **1873. April.**

The doctor's party started at 7½ a. m. of the 22d. The dogs were strong, and moved off briskly with the two heavily-loaded sleds, but at 4 p. m. the party returned, having broken their sled after getting as far as Cape Inglefield. When the sled was taken to be repaired, it turned out, on Sharkey's own confession, that he had broken it on purpose, and had resolved not to make the journey. Dragging the sleds over the hummocks was too severe labor. Jim, now, also refused to go, and he was instigated by his wife to persist in this refusal. Finding that none of the natives would accompany him, Dr. Bessels, whose resolution was still unbroken, proposed, with the consent of Captain Budington, to attempt a sledge-journey accompanied only by Hobby. His real plan, as now made known, had been to ascend as far as Thank-God Harbor, and, after recruiting there,

1873. April. and taking in a fresh supply of provisions, to go as much further north as practicable. The rapid dispersion of the ice and the lateness of the season compelled him to abandon this project.

On the 26th, a very strong gale from the N. E. broke up the ice a great deal, and made much open water; the ice was entirely cleared out from between McGary and Littleton Islands; the southwest point of the tongue of land upon which the house stood was washed by the waves. The gale continued on the 27th, when the water approached within 400 yards of the vessel. On the 28th, it was within 250 yards, and appeared to touch the shore a few miles to the north. On the 29th, a large seal was seen lying on the ice not far from the ship. Several of the crew tried to get near it, but were prevented by the broken ice. It was waked up by a shot from Hayes, but was not hurt.

Under the skillful direction of Mr. Chester, the boats, which were laid down on the 19th, were making rapid progress, and promised to be finished by the middle of May. On the 30th, the sails were made. Mr. Chester chose a square-sail for his boat, while Captain Budington ordered a sprit-sail. They were made of cotton sheets and some linen toweling.

The highest temperature during April was 21°.3; the lowest, —31°.6; while the mean was —6°.0.

Polaris House, near Life-Boat Cove, Spring of 1873.

1873. May.

Up to the 1st of May, there had been one hundred and two Esquimaux, men, women, and children, at Polaris House, with as many as one hundred and fifty dogs. The greater part of those who lived along the coast from Humboldt Glacier to Melville Bay made a visit to the house; for the whole population of that region does not probably exceed one hundred and fifty souls.

Hayes and Campbell started on the 1st, to spend a few days with the Esquimaux at Etah-Watanny. During the first four days of May, snow fell almost continuously. It was the heaviest snow-fall experienced by the expedition, the snow in some places being three feet deep. The natives said that such a storm occurs every year about this time.

On the 5th, Mr. Chester commenced building a small scow, to be used for hunting in open water, intending, upon his departure, to give it to Jim. It was entirely finished on the 7th, and painted and launched on the 12th. It frequently proved serviceable.

At 6½ a. m. of the 6th, Hayes and Campbell returned from Etah-Watanny. They had been on the road twenty hours, walking through the deep snow, and were very much exhausted. During their absence, they had had very bad weather, and were not able to go far from the igloos, so that they saw no game. They reported that Miouk died on the 3d. He had a very short sickness, and suffered from inflammation of the lungs.

1873. May. The men had a good opportunity of witnessing the funeral ceremonies. Shortly after Miouk's death, the body was wrapped in skins and placed on a sled, with all his hunting implements. The sled was dragged up the hill-side behind the village, and the body was placed in a hole dug in the snow, in a sitting posture, with the face to the west, his sled and other personal property being laid over him. All manifested their sorrow in their peculiar manner. The women carried a bunch of dried grass in the left nostril; and the men, one in the right. Budington says in his journal:—"As I understand, the widow of Miouk killed the youngest child, a baby about six months old. One of our men had prevented her from committing this crime on the day of Miouk's death; but Jim's wife, Evallu, informed me to-day that it was really done while our men were out on the ice. These natives are indeed to be pitied, and a mission station erected among these savages would be a good work. If we could take these natives down to the southern part of Greenland, as Dr. Kane had already proposed, I am certain our own Government, and also the Danish authorities, would approve of such an act."

The men witnessed also the ceremony of a divorce, which grew out of the following circumstances, the knowledge of which was gleaned from various sources:—Munny, a well-formed and good-looking Esquimaux girl, in love

with Ni-shet'-shu-lok'-ku, was forced by her father to marry Enu, a youth in better circumstances than her lover. After a lapse of time, the first lover's worldly circumstances were improved, and a divorce was resolved upon from her husband, with whom she had lived unhappily. The ceremony of divorce was as follows:—Munny lay upon her back on the sleeping-place of one of the igloos, with her knees drawn up, and a cord around her head. Ka-rush-uck, a very old woman, stood over her, holding the cord in her hand, and uttering what appeared to be a form of words, frequently changing the tone and measure; at intervals pulling on the cord, and raising Munny's head. This harangue continued for two hours. No Esquimaux was in the igloo at the time except Shukok, Munny's brother-in-law. As soon as the ceremony was over, Shukok took her on his sled to one of the settlements further south, where she was received by her sister and by her lover who immediately proposed and was accepted. During the ceremony of divorce, the husband was in another igloo crying bitterly. He lay all day with his face to the wall. He spoke to no one, and refused to eat. The next morning, he seemed more composed, although still very sad and desolate. He returned with the men to the house, and remained, wandering about several days in a listless manner, with scarcely a smile upon his face, looking very sad, as he tried to tell the story of his loss. *Munny "pe-*

1873.
May.

1873. May. *tong'-e-tuk*", or "*gone*", was the burden of his lamentation.

On the 9th, there was a very severe N. E. gale, the velocity rising to 48 miles per hour. On the 10th, two burgomaster-gulls were seen. On the 11th, Mr. Chester with Jim went to Etah to spend the day hunting; they saw no deer, but very many hares; but, unfortunately, Mr. Chester's cartridges for the breech-loading fowling-piece which he carried, were found defective. Jim shot a hare with a navy pistol.

On the 13th, Siemens, Hobby, and Mauch, with three Esquimaux, went hunting. The following account of their hunt is taken from Mauch's journal:—

"At 4.30 a. m. on the 13th, I left the house in company with the other men already named. For driver I had Kow-ket'-shu, a sentimental young man, who amongst us goes under the name of 'Simple Simon'. I must say I would have enjoyed the ride much better if my driver had not been talking the whole way of 'pid'-del-e-tay' (give me). In fact, I had to promise him everything that I possessed, and then he was not satisfied, but desired to know what he could get when the ship that shall take us away comes up here. In the first place, he wants a great many knives and guns, powder, &c. This formed the topic of his conversation, and whenever I tried to get him off that, he always recommenced the old story about

"*giving.* We stopped a short distance south of Port Foulke, behind a small island. Conducted by Shukok, we went over the plain back of Aubrey Mountain, where we expected to meet plenty of deer. However, we were sorely disappointed, being compelled to return almost without any game. Hermann, who, with Sharkey, had been on another place, had shot two hares. About noon, we left for Foulke Fiord, where we stopped at the foot of Dodge's Mountains, and went hunting around Alida Lake and Brother John's Glacier. Hermann again was the fortunate man. He shot another hare, and, on top of the hill, he fell in with a deer; but as his Sharps' rifle proved to be unfit for use, he did not get it. About 6 p. m., we left Alida Lake for our homeward route, and arrived at the house about 8 p. m., much fatigued from our tramp over the mountains." **1873. May.**

At 6 a. m. of the 13th, Mr. Bryan set out with Jim to go to Rensselaer Harbor, where he designed making time-observations for the meridian difference between that harbor, the best-established meridian on the coast, and Polaris House. The following account of the trip is taken from his journal:—

Crossing the ice of the little bay, they struck the ice-foot at Cape Hatherton, and followed it until they came to the bay just south of Cairn Point. Traversing this bay in order to shorten the distance, they took to the land, and

1873. May. passed over the isthmus which connects Cairn Point with the mainland. Thence they kept out on the smooth ice of the straits, and outside the hummocks. At the meridian of Annowaytok, they met a line of hummocks extending as far north as could be seen. Toward the west the ice was smooth and unbroken, toward the east it was old and exceedingly rough; icebergs and bergy masses were scattered all over it, rendering sledging almost impossible. Turning toward the land, with much difficulty, they crossed a belt of hummocks about three-fourths of a mile wide, and reached the ice-foot near the hut at 11.30 a. m.

Owing to the extreme roughness of the ice, it was necessary to hug the ice-foot, which, following the sinuosities of the coast, greatly increased their journey. The snow upon the ice-foot had become soft under the sun's influence, and, as it was quite deep, it proved to be a great impediment to travel. Quite an amusing incident occurred on the way. Mr. Bryan, sitting on the sled behind Jim, being fatigued, fell asleep. He was suddenly awakened by feeling the sharp sting of Jim's lash across his face. He began to expostulate mildly with the driver, when he discovered that he also was asleep. The dogs were slowly and laboriously wading through the snow, urged to their utmost by the continual application of the whip in the hands of the unconscious Jim. They arrived at Rensselaer Harbor at 10 p. m.

1873. May.

Stopping on the land west of the island on which Kane had his observatory, they built a snow-house. The 14th was cloudy. The 15th set in cloudy, and by noon there was no indication that it would clear up. In making the arrangement with Jim, Mr. Bryan had hoped that the weather would be favorable, and the contract had included only one sleep. Not wishing to impose upon the good-natured Esquimaux, he told Jim to return, leaving one of his dogs as a companion. At first Jim did not wish to go, but, being further urged, started at 1 p. m., carrying a note to Captain Budington, and reached the house early on the morning of the 16th. Just three and a half hours after Jim's departure, it began to clear off. The copper bolt, set in lead in the crevice of the rock by Dr. Kane, left there to mark the site of his observatory, was found, and observations were successfully made near it. At the spot where Baker and Shubert were buried, Mr. Bryan found that the white paint with which their names, with suitable inscriptions, had been marked, had almost entirely disappeared from the rock; a few words only could with difficulty be spelled out. A great many pieces of wood, iron, glass, crockery, leather, cloth, and rope lay about the island and on the mainland.

The necessary observations having been taken, Mr. Bryan resolved to return. After eating a hearty meal, and giving the rest of the provisions to the dog, he made up

1873. May. his bundle, and, finding that the dog would not carry it, he shouldered it himself, and started on his toilsome tramp at 7½ p. m.

After a walk of twenty hours, he came to the hut at Annowaytok, where he began to feel tired and hungry. The bundle, which at first had seemed quite light, now felt very weighty, and he left it on a rock near the ice-foot, where it was subsequently recovered. After a rest of two hours, at 5½ p. m. of the 16th, he resumed his journey. The ice upon the sound, being smooth and free from snow, was better for walking than the ice-foot; it also shortened the distance by enabling the traveler to pass from cape to cape. Walking for some distance, he came to a fresh crack, about 2 feet wide, where, forgetting how tired he was, he made a false step and fell into the crack up to the arm-pits. After taking off his stockings and wringing them out, so that he could walk, he felt very much refreshed. Soon afterward, he came to a large piece of seal meat and blubber, which had been left on a cake of ice by some of the natives. The dog and the man saw the meat at about the same time, and had a race for it. The dog reached it first, but did not get more than one bite before he was driven off. The meal was not very palatable, for during this the breeding-season the flesh of the male seal is very strong and smells villainously. It is even offensive to the natives. Hunger, however, over-

came all fastidiousness, and Mr. Bryan's knife was soon at work, large masses being ravenously eaten. After satisfying their hunger, both man and dog proceeded on their journey strengthened. The vile taste of the seal meat, however, lingered for a long time. 1873. May.

At 2.10 a. m. of the 17th, much to the relief of Captain Budington, who had begun to be apprehensive about him, Mr. Bryan reached the house. The distance which he had walked in these 28½ hours of constant travel, taking into account the windings of the coast, was estimated to be at least 60 miles. Dr. Kane had called the distance from Rensselaer Harbor to Etah 91 miles, and Etah was less than 20 miles from Polaris House. Soon after Mr. Bryan's return, his eyes began to hurt him, and he suffered the agonies of snow-blindness in its worst form for two days. His face also was blistered so badly that all the skin came off. By the 20th, however, he had entirely recovered from the painful effects of his tramp.

On the 14th, three Esquimaux, who had been absent 42 hours on a hunt north, brought to the house twelve seals; snow-birds and gulls were seen near by. On the 16th, the temperature was for the first time above the freezing-point of water. The rocks, however, had, for some time, been furnishing water to the birds and foxes, from the melting snow. On the 17th, the boats were painted and the storeroom was taken down, most of its wood being used for fuel.

1873. May. On the 18th, there was a great deal of water in the straits, where the birds flocked in numbers. The atmosphere was wonderfully clear, and portions of the land north of United States Sound could be seen. On the 19th, Hobby and Mauch went out in the little scow and shot six dovekies, and on the 22d three more were shot by Mauch. On the 21st, Siemens shot two hares on the plain east of the house. On the 23d, Jim and Enu came from the north with six seals; Jim had shot two with a navy pistol. On the 24th, a hare was killed. Jim took Dr. Bessels to Brother John's Glacier, and returned to the house, leaving the doctor there, whose object was to examine the glacier and make some observations that would show its rate of progress.

On the 25th, Coffin shot a hare. Preparations were made for observing the eclipse of the sun predicted for the early morning of the 26th; the observations were successful.

Two sleds with natives came from the south, bringing fifteen auks, which they had killed on their way up; they reported that large flocks were flying into Foulke Fiord.

On the 27th, the boats were finished; they were well built; their dimensions were,—length, 25 feet; breadth, 5 feet; and depth, 2 feet 4 inches. There was room for six rowers and the cockswain; a spare oar was provided, fit-

ted as a mast; the boats were flat-bottomed. Mr. Chester had exhibited not only great skill in workmanship, but great ingenuity in selecting and adapting the material, in the use of imperfect tools and in supplying the many deficiencies incident to the situation. Tools were made when necessary; screws took the place of nails; and the boats were strengthened by copper rods amidships and between the timbers. The feeling of gratitude to Mr. Chester for providing these efficient means of escape was deep and universal. **1873. May.**

On the 27th, Mr. Bryan, accompanied by Awah-tah, set out to join Dr. Bessels, in order to determine the meridian difference between Port Foulke and Polaris House. They crossed the land, as they had done in the autumn. Mr. Bryan wished Awah-tah to go directly to Port Foulke and leave him there, while he brought the doctor down from the head of the fiord; but the Esquimaux wanted Mr. Bryan to see him catch auks. Accordingly, they ascended the fiord, stopping not far from its head, at the base of Dodge's Mountains, the sloping side of which covered with large stones, fairly swarmed with the little creatures. The view at times was obstructed by them, and the rocks were whitened by their breasts; their chirping filled the air. Having fastened the dogs at the foot of the mount, the party climbed part of the way up, until they were fairly in the midst of the little creatures,

1873. May. where, with a small net made of sinew and fastened to a hoop 18 inches in diameter, on a pole 10 or 12 feet long, Awah-tah caught them as they flew within his reach. They were constantly in motion and in such numbers, that he very soon bagged a large quantity of them.

After the dogs had a hearty meal, the journey was resumed. Reaching the head of the fiord, they found that Dr. Bessels had finished his work, and was ready to return. Taking a short rest, the party again set out, stopping at Etah, and depositing there the doctor's camping arrangements. They then crossed the fiord, and, upon reaching the land, Mr. Bryan and the doctor left Awah-tah, at his own request, at the sled, and walked over to Port Foulke. They found that Sonntag's grave had been despoiled; the gravestone was down, and his bones were scattered about. They replaced his fine large skull in the grave, collected all the other bones, and refilled the grave; the headstone was also reset. It was afterward learned that the Esquimaux had dug up the grave to get the wood of which the coffin was made. No signs of the observatory could be seen; the relics were very few, consisting of some pieces of wood, a small piece of rope, and broken glass. Dr. Bessels at midnight returned with Awah-tah to the house, leaving Mr. Bryan to make some observations, in which he was successful, notwithstanding Dr. Bessels had carried off the trough of his artificial

Foulke Fiord, May 27, 1873.

horizon, for which he was obliged to make a wooden substitute. When about to start on his journey home, a native, sent by Captain Budington, came to him with a sled; he arrived at the house at 11 p. m. Jim, Enu, and Acoo returned from the north at about the same time with fourteen seals. 1873. May.

The 29th was fully occupied in active preparations for the departure of the party from Polaris House. Each one being allowed to carry eight pounds only, it was hard to decide what should be taken and what left. Provisions for two and a half months were carefully packed in small bags for easy handling. Some of the rigging was chopped into small pieces for fuel, and excellent fuel it made. The crews were selected and assigned; Captain Budington's crew being as follows:—N. J. Coffin, stroke; Wm. Morton, A. A. Odell, Noah Hayes, J. B. Mauch; R. W. D. Bryan, bow. Mr. Chester's crew consisted of Dr. Emil Bessels, stroke; Emil Schumann, J. W. Booth, Walter Campbell, Henry Hobby; Hermann Siemens, bow. The position of the house, as determined by Mr. Bryan, was,—latitude, 78° 23′ 30″ N.; longitude, 73° 21′ 10″ W.

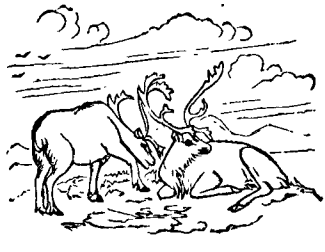
On the 30th, almost all the land-ice broke away, and with it the Polaris went adrift. She was carried about 200 yards toward the south, where she again grounded. At high tide her upper deck was about two feet below the surface of the water. Siemens and Hobby went

1873. June. out to her in the little scow, and fastened two large hawsers to her from the rocks on shore. It was thought she might be driven high and dry upon the beach in the autumn, and furnish to the Esquimaux a supply of wood.

Meteorological observations were now discontinued. They had been regularly made from the 1st of November, Dr. Bessels observing during sixteen consecutive hours each day, and Mr. Bryan who relieved Mauch on the 21st of November, observing during the remaining eight.

On the 31st, the boats were carried down to the shore, and the provisions were distributed and got ready to be put on board. The 2d of June was the day appointed for sailing.

On the 1st, Captain Budington and Mr. Chester were quite sick with pains in the chest; on the next day they were much better, but Booth began to suffer from the same complaint. A gale was blowing from the N. E., and it would have been imprudent to launch the boats.



XX.

CHAPTER XX.

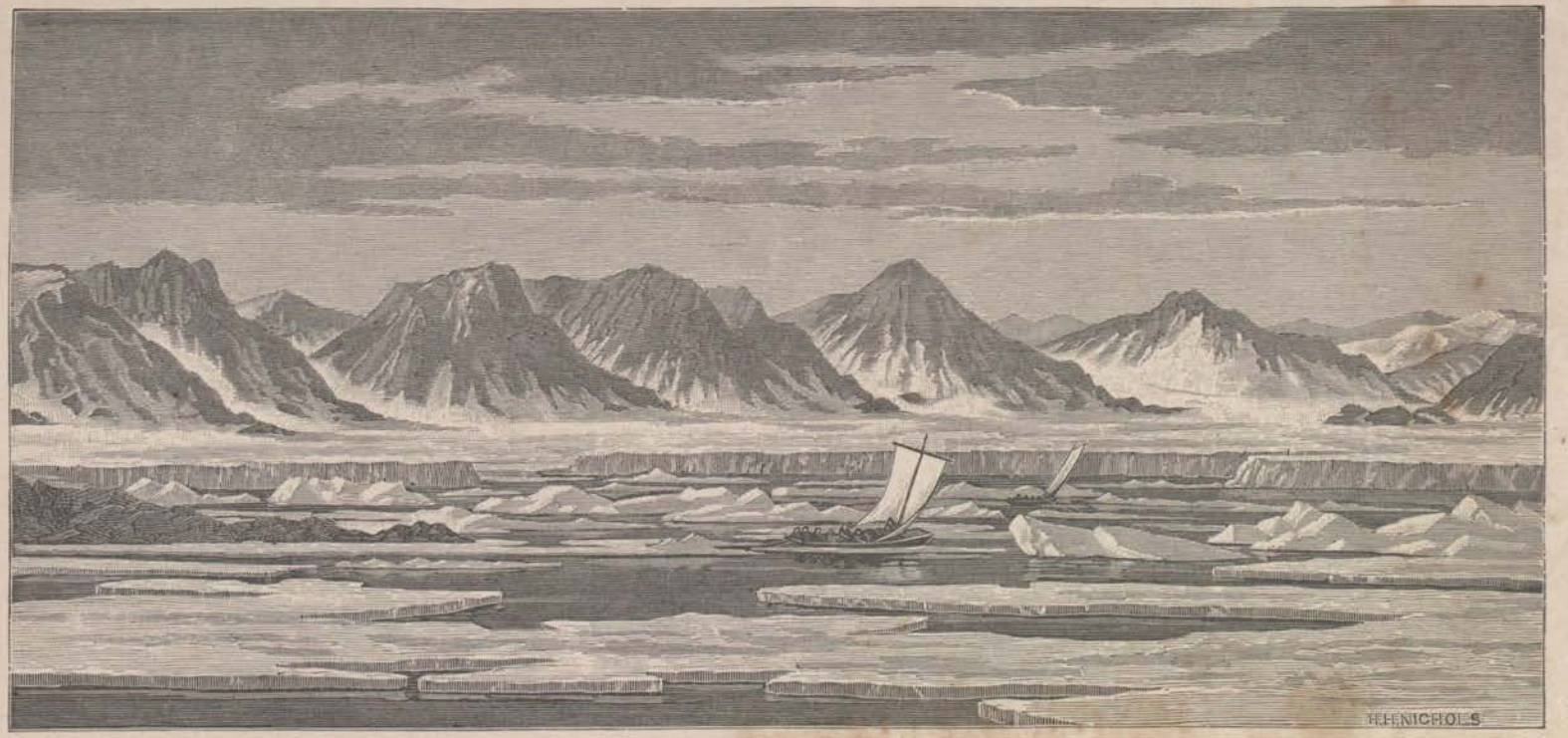
On the 2d, Captain Hall's large Arctic library was carefully packed in his trunk, taken about one-fourth of a mile in a direction E. S. E. from the house, and there placed in a cache; where were also deposited the pendulum, the transit-instrument without its glasses, three box-chronometers (sidereal), and the two log-books of the Polaris, together with a statement of what had been done by the Expedition, and of their present prospect of reaching in the boats either one of the Scotch whalers at Cape York, or the Danish settlements. 1873. June.

All hands were called at 1 a. m. of the 3d, in order to be ready to get off at high tide. There was some difficulty in launching the boats, on account of the swell and the loose cakes of ice. Jim and his family were loath to part with the "*Kodlunahs*" whose hospitality they had enjoyed during the winter, and the sentiment was reciprocated. The other Esquimaux did not display any feeling; this was attributed, not unreasonably, to their extreme

1873. June. pleasure on coming into possession of so much valuable property.

The boats, having been freighted and manned, got under way, and at 2.30, stood down the coast, with a fair wind, Chester being ahead. At 3.45, Cape Ohlsen was passed. From this point to Cape Alexander, which was doubled at 6.22, the sea was quite rough. The boats leaked a little, but here proved to be very good sea-boats. When they were south of Cape Alexander, the wind going down it was necessary to take to the oars. At 11, the boats came to a loose pack which they could not enter; and, not being able to effect a landing, they returned to Sorfalik, where they arrived at 2 p. m., and were hauled up on the ice-foot, near the deserted stone huts of the Esquimaux. The rest of the afternoon was spent in eating, and hunting auks.

At 6.10 a. m. of the 4th, the boats were again launched, and the ice being compact near the shore, a straight course was shaped for Hakluyt Island, which was reached at 9.20 p. m., after an almost uninterrupted pull of fifteen hours. It being low tide, it was impossible to haul the boats up on the ice-foot. A hot soup made from the auks proved a delightful addition to the supper. Captain Budington suddenly became very sick, and for a time there was doubt of his recovery, but he finally rallied. The watch being set, the crews went to sleep, but at high



Boats passing Sorfalik, June 3, 1873.

water all hands were called, and the boats were hauled up on the ice-foot. At that time, a very strong breeze was blowing, which made the rocks an uncomfortable place for sleeping; Mr. Bryan, however, with Hayes and Mauch, found a large rock, under the lea of which they made their bed by digging away a bank of snow and putting moss in its place, over which they spread a blanket, covering themselves with two other blankets. They slept comfortably, but when they awoke found themselves completely covered with drifted snow. **1873. June.**

A severe gale from the S. W. on the 5th, kept the party in the same place. A raw and dreary day was passed in the boats, under the awning. Some of the crew ventured on a ramble inland, and found a rookery of lummes and little auks on the north side of the island, where the cliffs rose almost perpendicularly out of the sea. Toward evening, the gale had increased so much that the spray came over the boats, and it was necessary to haul them higher up.

The 6th was another wretchedly uncomfortable day, with a violent snow-storm and a low temperature. The party was compelled to resort to exercise to keep warm, which, owing to the snow and wind, was difficult and painful. At 3.30 a. m. of the 7th, the gale died away, and the falling snow was scarcely noticed; the sun came out and the weather was bright, with a light breeze from the

1873. June. southwest. Captain Budington's boat was cleared out, and turned bottom up to repair the leaks.

The cat had become quite wild from the excitement of the journey and its confined quarters; when taken from the boat, it ran away, disappeared among the rocks and was not again seen.

The latitude observed was 77° 24′ N. The condition of the ice toward the south was examined by Mr. Bryan, who reported that there was a good chance to reach Cape Parry. The height of his lookout, measured by an aneroid barometer, was 1,325 feet.

At 6 a. m. of the 8th, all hands were called, for the second time during the night. Mr. Chester shoved off a little before 8, and made an unsuccessful attempt to double the southwest point of the island; the passage was made between it and Northumberland Island, where a good deal of very close ice was encountered; the wind was blowing strong from the S. W., and the snow was falling thickly. The coast of Northumberland Island was followed until the pack coming in made it necessary to seek the ice-foot, which was done at 11 a. m. At the landing, there was an extensive rookery of little auks, three hundred and fourteen of which were shot at a short distance from the boats. The birds crowded so closely together that many were killed at one shot.

The boats started again at 8 a. m. of the 9th, but

Boats near Hakluyt Island, June 8, 1873.

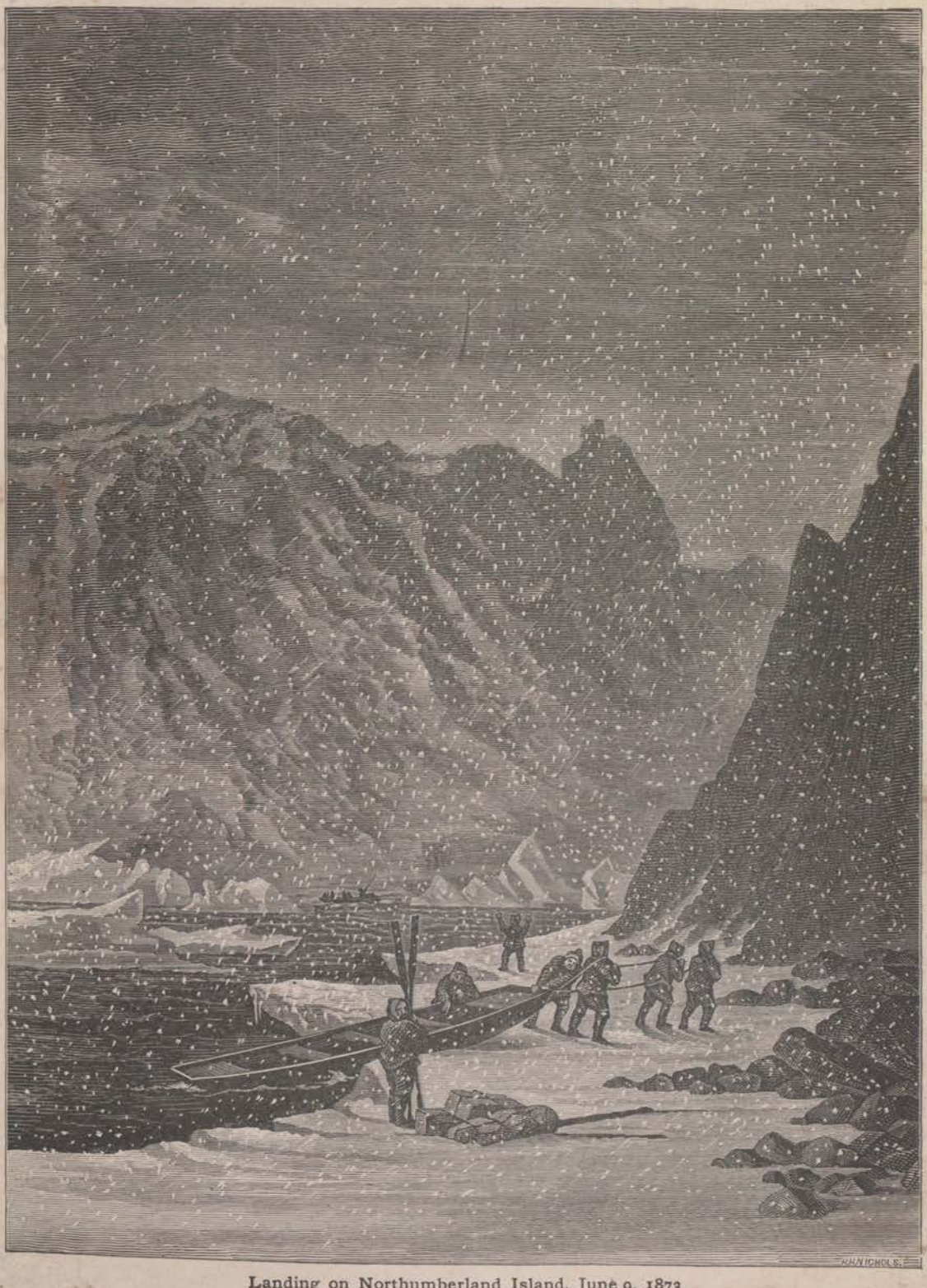
were soon driven back by a heavy snow-squall and a southwest wind which brought in the pack; at 9 a. m., they were hauled up again on the ice-foot. The boats continued to leak a little, but were easily kept free by occasional bailing. **1873. June.**

On the morning of the 9th, every auk had disappeared; geese, ducks, gulls, snipes, snow-birds, ravens, a swallow, and foxes were seen; some moss was found, which was used for fuel. At 9.30 a. m. of the 10th, the party made another start, pulling along the island until compelled to stop by the pack, when the boats were again hauled up on the ice-foot, at 11.15 a. m. Mr. Chester, after ascending a hill, reported a good opportunity for reaching Cape Parry, there being a wide lead entirely across Whale Sound. Getting under way at 8 p. m., the boats coasted the island a short distance, and then struck across the sound; southwesterly winds had, however, closed up Chester's lead. For a time, efforts were made to open a passage for the boats. When about one-third of the distance across the sound, at 10.30 p. m., the ice suddenly closed, pressing heavily against Captain Budington's boat, when the crew leaped upon a floe and hauled up the boat rapidly, but for which she would have been crushed. At this time, Mr. Chester's boat was ahead, and in a small pool which, closing shortly after, compelled him also to haul up on the ice. Captain Budington's crew

1873. June. did not turn in, but remained all night trying to keep warm by exercise on a cake of ice not more than twice as large as the boat; the temperature was 23°. The cake drifted at first north, toward the island, and then followed its western shore, at a distance of about four miles. A slight breeze from the east aided their progress toward the N. W.; there was some fear of the boats being separated.

At 6 a. m. of the 11th, Captain Budington's boat was opposite the point from which it had started to cross the sound. Quite a space of open water was seen between the land and the edge of the pack about a mile distant, and it was decided to make an effort to reach it.

At 7.30 a. m., the movement was begun. After several trips, all the provisions were carried to another floe, nearer the open water; then, cutting down the hummocks to make a smooth way, the party returned and dragged the boat to the provisions. After about ten such trips, the water was reached at 11.30 a. m., when, rowing against a head wind and sea for an hour, the two miles of open water were crossed, and the boat was hauled up on the exact spot which it had left sixteen and a half hours before. Mr. Chester, with his boat, had already arrived at the same place, having had a longer distance to make, but being more successful in finding leads and in being able to drag his loaded boat over the ice.



Landing on Northumberland Island, June 9, 1873.

1873. June.

The crews were very thankful to get out of the pack; they were grateful for their escape from the danger of being bound in it, and carried with it to the south. The exposure on the floe during the night had made nearly all of Captain Budington's crew snow-blind; and every one's face and hands were so badly burned that the skin came off, causing great suffering.

The grateful prospect of a Sound clear from ice was seen from the hill-top on the 12th. At 10.30 a. m., the boats got under way, and, after passing through a small stream of ice, found open water. A good breeze blowing out of the sound enabled them to carry sail until 5 p. m., when, being within a few miles of Cape Parry, the wind died away and the men took to their oars. At 6, the cape was rounded; at 8.45, the boats stopped on the fast ice, just above Fitz Clarence Rock, for half an hour, until the tide which was running very strong against them, turned; at 9.45, they were hauled up on Blackwood Point. The boats were again launched at 11.45 a. m. of the 13th, and sailed for an hour under a light wind abeam, after which the oars were used faithfully until 9.30 p. m., when the party landed at Dalrymple Island, having stopped at 6. p. m. about half an hour for lunch. The ice was fast across Wolstenholme Sound, so that the boats could not go inside of the islands. Many walruses, seals, and narwhals were seen, and also a great number of

1873. June. birds. The last few hours of the journey had been spent in an almost vain struggle against a strong wind and tide; the island was reached, however, just in time to escape a severe southwest gale. It was expected that many ducks' eggs would be found on the island, but the season was too early.

Forty-five minutes past meridian on the 14th, another start was made. The boats kept down along Wolstenholme Island until they came to a close pack, where they were hauled up on the ice-foot at 2.30 p. m. Captain Budington at once dispatched Messrs. Bryan and Odell to the hills to report upon the prospect of proceeding further. They walked down the ice-foot a short distance, until they came to a place where an ascent of the steep mountains was practicable. On reaching the summit, it appeared that the fast ice extended from the island, south, along the coast of the mainland; but outside there was a passage between the land-ice and the pack as far as Conical Rock, which was as far as they could see. They could perceive that the land-ice extended out into the straits a considerable distance, and that it would require a long detour to get round it. The aneroid barometer at the summit of their lookout read 28.69 inches; the difference between this reading and that at the sea-level, indicated a height of about 730 feet. Whalers were now anxiously looked for.

Desiring to get to Cape York as soon as possible,

Boat Camp, Dalrymple Island, June 13, 1873.

Captain Budington determined to take the risk of standing out, and started again at 10.30 p. m. He had a hard pull against a very strong wind. At 3.45 a. m., of the 15th, not being able to make headway against the wind and sea, he hauled the boats up, but finding that he was not on the fast ice, at 10.30, he again launched them, and at 7.30 p. m. reached the south side of Conical Rock, where he encamped upon the ice of a small bay. During part of the passage, the wind had been favorable. 1873. June.

In the afternoon, the first light rain of the season fell. During the 16th and the 17th, the weather was so bad that Captain Budington lay by; the storm of wind, snow, and rain confining the people to the boats, which it was necessary to haul further back on the ice. Conical Rock was left at 6.30 a. m. on the 18th. The land-ice having been followed about 5 miles, at 8.45 a. m., the incoming pack rendered it necessary to haul up on the floe. The greatest trouble in camping upon the smooth land-ice was the difficulty of obtaining water; to melt snow consumed the fuel very fast. At midnight, Mr. Bryan, by observation, found the latitude to be 76° 02′ 30″ N.

Again, at 7.30 a. m. on the 19th, Captain Budington set out with a fair wind, but after an hour, was obliged to haul up on the ice in consequence of its closing. The object now was to keep close in with the fast ice, and take

1873. June. advantage of every opening made in the pack, as by holding on to the fast ice, the ground already made would be kept. At noon, the pack moved off, and the boats got under way; but, after making about 13 miles under sail, they were forced to stop at 2.30 p. m. A severe gale, which prevailed during the latter part of the day, had broken off a very large portion of the land-ice; for at 8, the party found that they were adrift, and were not able to see the extent of the floe. At midnight, they again got under way, and, after a pull of two hours, reached the land-ice; but, the part upon which they were, being very rotten, they took the first opportunity to move on. Starting at 3 a. m., they were tempted by a very fine lead to run off from the land-ice, and, after a hard pull of seven hours, they found the end of the lead, and hauled up on a large floe. They then discovered, however, that they were not on the land-ice, as expected, but were adrift. They were unable to help themselves, and were in danger of being carried out to the middle of the channel, and then down toward Labrador and the Atlantic.

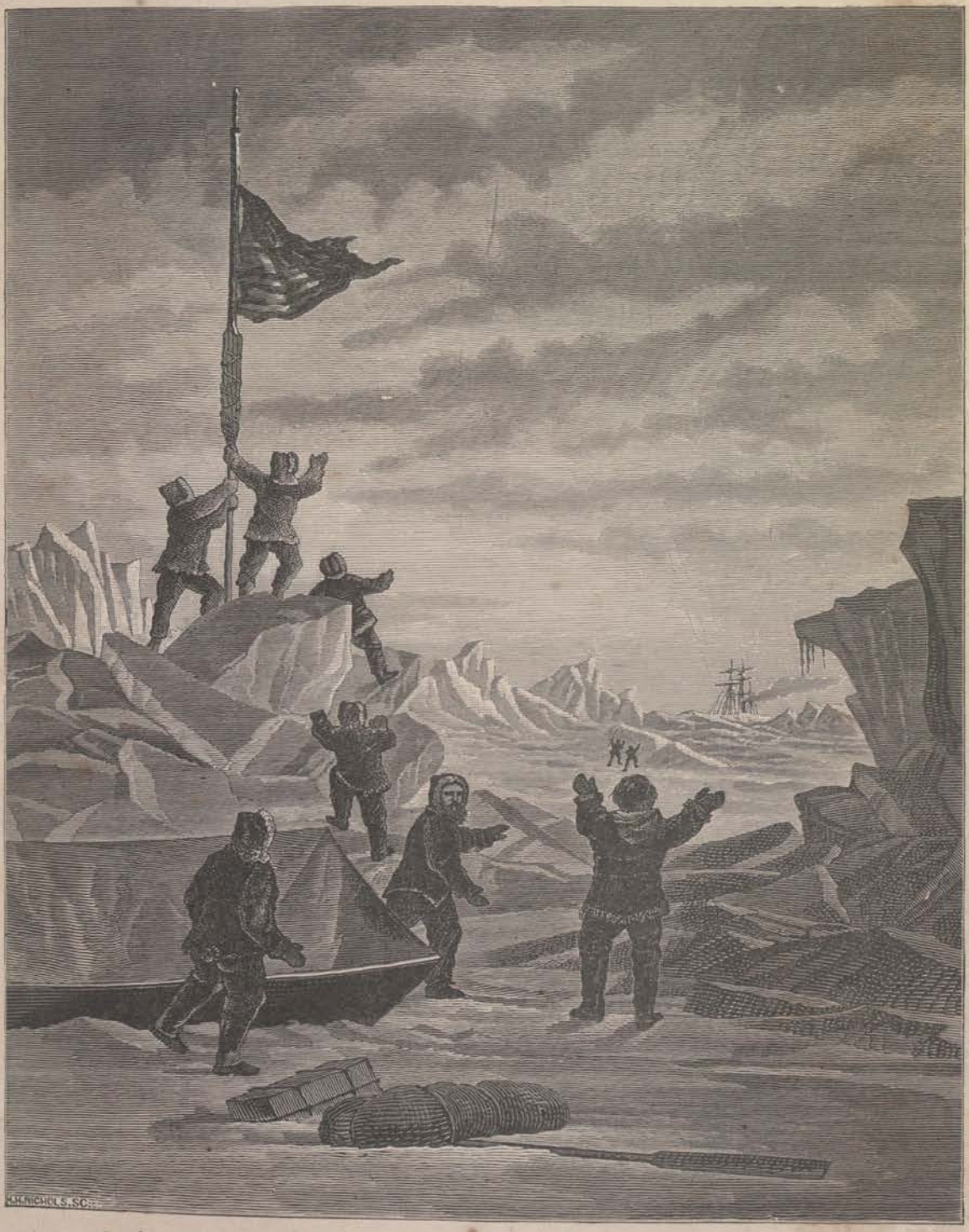
The following account of the 21st is taken from Budington's journal:—

"At 8 a. m., we left the floe, proceeding through loose pack-ice. After an hour, we were compelled to haul up again. Here we were compelled to stop

"for about an hour; then the ice commenced to slacken in a northeasterly direction, and we immediately launched our boats. After a short pull through the loose pack, we made a large body of open water, in which we proceeded in an E. S. E. direction (by compass), this being the direction in which I had observed the farthest land in Melville Bay. It was fortunate I did take the direction by compass, and also informed Mr. Chester of our course, for a heavy fog soon set in, which, in fact, became so thick that we almost lost sight of the other boat. At 4 p. m., we reached the fast floe, which was making from Cape York right across the bay in a direction about S. E. by E. Here we enjoyed light, favorable air from the N. E. and plenty of open water; we therefore proceeded along the floe under sail until 7 p. m., when we had to haul up our boat and drag it over a narrow tongue of ice, launching her again on the other side of the tongue. After a short time, the ice again compelled me to haul up on the floe at 9 p. m., and, as there was no further chance of proceeding, we encamped for the night. One boat (that is, mine) has been leaking so badly that we caulked her again all over after our arrival here." **1873. June.**

During the night, the pack pressed very heavily against the land-ice near the encampment, and the boats were taken further back to protect them from the pack, which was eating its way into the floe. Soon after the

1873. June. removal, the pressure ceased, and a large portion of the floe broke off. The boats again started at 8.30 a. m. of the 22d, but were able to advance only half a mile. From this point, it could be seen that the pack pressed close against the land-ice for several miles; and the only hope was for a northerly wind that would drive the pack off, and open a passage, though it was feared that a very strong wind might break off a large portion of the Melville Bay land-ice, and carry the boats with it out into the pack. At midnight, the ice began to open, and at 1 a. m., the boats were launched. After having gone a short distance, it was necessary to haul them over the floe about half a mile. Again launching, the party rowed a short distance, when the pack moved in very rapidly. Mr. Chester's boat, which was a little ahead, passed through a narrow strait, but Captain Budington's was caught between the floe and the pack. He saw the danger, and called upon the men to pull harder; but, being tired and not seeing the danger, they did not exert themselves sufficiently. When fairly caught, all hands jumped upon the ice, and, by great exertion, hauled the loaded boat up, on her broadside. One plank was stove, but was speedily repaired by tacking tarred canvass over the opening, after which the boat was again launched in open water. It was impossible to go much further, however, on account of the pack, and the party lay by. At 4.45 a. m., plenty



Sighting the Ravenscraig, June 23, 1873.

of fresh water was obtained from ponds on the neighboring icebergs. All hands lay down, except Mr. Bryan and Mr. Chester, left on watch. 1873. June.

At 10 a. m., Mr. Chester electrified the company by calling out "Ship ahoy!" About ten miles to the south, fastened to the land-ice, were seen the three masts and the smoke-stack of a bark. There was a thrill of joy. Here was the Scotch whaler that had been expected. The flag was hoisted on two oars lashed together. The bark, by running up her ensign, soon gave notice that the signal was seen. Mr. Chester and Hobby were at once dispatched to communicate with the vessel, and ask passage for the company. They were met, when little more than half-way, by ten men who had started out to render assistance. Two of them turned back to report to the captain; the remaining eight, accompanied by Chester, continued on toward the boats, which they reached at 3 p. m. They had been so thoughtful as to fill their pockets with ships' biscuit, not knowing but that the strangers were actually starving. They communicated the grateful intelligence that the ice-floe party, under Captain Tyson, had been picked up.

Captain Budington ordered all hands to prepare to walk to the vessel. After taking a good meal and collecting their personal effects, together with the records and collections, they started at 6 p. m., being very kindly assisted by their new companions. After a weary tramp

1873. June. over the floe, rendered worse by the rotten condition of the ice and by the soft snow, they arrived at the vessel at midnight, where they were most kindly received and welcomed by Dr. A. D. Soutter, the surgeon. The ship lay in latitude 75° 38′ N., longitude 65° 35′ W. She proved to be the Ravenscraig, of Kirkcaldy, Scotland, owned by Mr. Ninian Lockhart, and commanded by Captain William Allen.

Every one on board did his utmost to make the shipwrecked party comfortable. Dry and warm clothing was provided, and a plentiful table was spread before them, far exceeding anything they had been accustomed to for nearly two years. They needed no soporific to induce sleep when they turned into the welcome bunks. The Ravenscraig not being built for carrying passengers, it was at first a question how the new-comers could be accommodated. Scotch hospitality, however, soon devised the means. Captain Allen insisted upon Captain Budington taking his state-room and sharing his bunk; Mr. Chester enjoyed a cushioned settee in the cabin; Dr. Bessels occupied Dr. Soutter's bunk; the mates, Burnet and Smith, took care of Morton and Schumann; when Anderson, the second engineer, turned out to take his watch, at 2 a. m., Mr. Bryan turned into his bunk and finished the night: forward, the men were very kindly cared for, the seamen sharing with them their bunks, fitting up special ones,

taking them into their messes, and showing them every possible kindness and attention. 1873. June.

The Ravenscraig had been detained unusually long at what is known as the "Southwest Fishing", just off the mouth of Hudson's Straits, and had come to Melville Bay too late to find a clear passage. Seven of the whaling fleet had passed through the bay early in the month; but one other Scotch vessel, the Tay, remained behind, her detention being occasioned by some repairs to her machinery. The Harold, a Norwegian vessel, on its first cruise, also passed through Melville Bay later in the season. So that, if Captain Budington and his party had missed the Ravenscraig, they would still have had a chance of being picked up. They had never doubted their ability, however, to reach the Danish settlements. It is true that the most dangerous part of the voyage was still before them, for, as they advanced, the ice would have opened, and they would have been exposed to the danger of gales of wind and the heavy seas accompanying them—a danger which would have been very formidable in their small, shallow, flat-bottomed, unseaworthy boats. They had used up all their fuel, but had accomplished about one-half the distance, had abundance of provisions, and were becoming inured to the labors and hardships of their situation. But while they were thus trustful of the future, they were supremely happy in meeting with the Ravenscraig.

1873. June. The watch in the crow's-nest of the Ravenscraig had seen Budington's party on the ice at 5 a. m., but had taken them at first for Esquimaux, the boats looking like sleds, and their pile of provisions like a team of dogs lying on the floe. On getting nearer, the watch saw the boats more distinctly, and the surmise was that one of the vessels which had preceded the Ravenscraig had been lost, and that her crew was returning in her boats. When still nearer, the men were more distinctly seen walking on the floe, some of them having hats on. This puzzled the people of the Ravenscraig, since all the Scotch whalemen wear caps. It was then suggested that it might be some of the crew of the Polaris, but the idea was not at first generally accepted. They could not for a time make out the boat flag; but they hoisted their own flag, and sent out the men which met the party from the boats.

On the 25th, twenty of the crew of the Ravenscraig, accompanied by the carpenter and two other men of the Polaris, walked to the boats, and brought back Mr. Chester's boat, together with a few valuables which had been left. This boat was a little damaged by dragging it over the ice; Captain Allen at once set his carpenter at work to repair it, and secured it on deck. It was carried to Dundee, and Mr. Lockhart afterward presented it to the Smithsonian Institution. It was brought to the United States free of cost by the steamer Georgia, of the State

Line Steamship Company. Placed at the International Exhibition at Philadelphia, May 10, 1876, by the side of Kane's boat Faith, it formed part of the Arctic collection furnished for the Centennial by the United States Naval Observatory. **1873. July.**

On the 26th, the ice opened a little, and the Ravenscraig steamed slowly for about four hours; the next day she succeeded in getting a few miles further.

Captain Allen determined to accomplish something on the 4th, and the Americans on board assured him that he would have good luck on account of the day. He passed the day in the crow's-nest, and kept the vessel butting at the ice. She fought her way foot by foot. When she was brought up by the ice, she was backed, if there was room, and then was started forward at full speed. The shock as she struck the ice almost always started a crack, and, unless the floe was heavy, the ship buried herself half her length in it; besides this, the vessel was rolled, the men running in a body from side to side. Thus she made gradual progress until evening, when she came into open water

Having reached the latitude of Conical Rock, she turned to the westward, and on the evening of the 5th, made the west land. Early on the 6th, she entered Lancaster Sound and kept along the northern coast until, passing Cape Warrender, she crossed to Admiralty Inlet.

1873. August. When off Cape Crawford, on the morning of the 7th she spoke the steamer Arctic, and received a visit from her commander, Captain William Adams, accompanied by Captain A. H. Markham, of the Royal Navy, who on his return referred to this visit in his admirable and popular work, "A Whaling Cruise to Baffin's Bay."

Owing to the crowded state of the Ravenscraig, one-half of the Polaris men now went on board the Arctic; they were Mr. H. C. Chester, Dr. Emil Bessels, Mr. Emil Schumann, Noah Hayes, Hermann Siemens, Henry Hobby, and Walter Campbell.

In the pursuit of his business, Captain Allen ran into the mouth of Barrow Strait, and then returned to Prince Regent Inlet.

On the 17th of July, he spoke the steamer Intrepid, Captain Soutar, who expressed a desire to have some of the Polaris men. Accordingly, Mr. R. W. D. Bryan, J. B. Mauch, and J. W. Booth were transferred to the Intrepid, and the vessels parted company.

The Arctic, having filled up, turned her head homeward on the 10th of August, and, on the 20th, the Ravenscraig was spoken, and the four Polaris men still remaining in her were transferred to the Arctic; they were Captain S. O. Budington, Mr. William Morton, A. A. Odell, and N. J. Coffin.

The Intrepid was thought to be so far off from the

Arctic that she could not be reached without the sacrifice of too much time and fuel, and the Arctic, with her eleven Polaris passengers, resumed her voyage. On the afternoon of Friday, September 19, she anchored in Dundee. 1873. September

Captain Budington and his associates received every attention from William Reid, Esq., United States Vice-Consul. By the courtesy of the officers of the Inman Line of Steamships, they were offered first-class passage in the City of Antwerp, and sailed from Liverpool on the 23d. They speak in the highest terms of the kindness of Captain Laver and his brother officers, and of the civilities received from the passengers.

On arriving in New York, the vessel was met at quarantine by the navy-yard tug Catalpa, which carried Captain Budington and his companions to the United States ship Talapoosa at the Brooklyn navy-yard, in which vessel they arrived in Washington on the 7th of October.

On the 12th of September, the party left on the Intrepid, learned that the Arctic had sailed for Dundee, having on board all their comrades.

On the 13th, the Eric, Captain J. B. Walker, was seen to have her ensign flying—a signal that she was

1873. October. about to start for home. The Intrepid ran down to her to send letters, and on Captain Walker's offering to take the three Polaris men with him, they were transferred. They were treated with great consideration by Captain Walker and his officers, and by an English gentlemen, Mr. J. Rickaby, a passenger, whose courtesy will never be forgotten.

On the 28th, when off Cape Dyer, the final departure was taken for Scotland. Head winds and rough weather kept them beating about in Davis Strait for a long time, so that it was not until the 12th of October that they passed Cape Farewell. At 5 a. m. of the 20th, Cape Wrath was passed, and after a stormy and dangerous voyage they finally anchored in Dundee at 3 a. m. of the 22d.

They received every attention from Mr. Reid, the vice-consul, and many kindnesses from the people of Dundee.

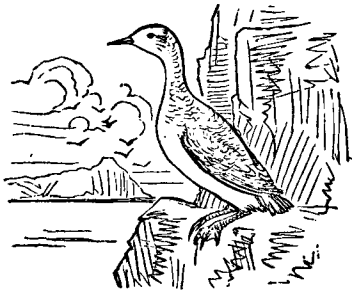
Mauch and Booth, through the courtesy of the officers of the State Line, were given first-class passages in the steamer Georgia. They sailed from Glasgow on the 24th, and arrived in New York on Friday, November 7, having been very kindly treated by Captain Cooper and his officers and by the passengers.*

* By the provisions of an act approved by the President of the United States June 23, 1874, "appropriate compensation and acknowledgment" were authorized to be made to the "owners, officers, and

Mr. Bryan, by means of a cable dispatch, obtained permission from the Secretary of the Navy to remain one week in Europe. He visited Edinburgh, London, Paris, and Dublin, and left Queenstown on Saturday, November 1, in the Java, of the Cunard Line, arriving in New York on the 13th. **1873. November**

"sailors of the British whaling and sealing steamers which contributed to the rescue of the survivors of the Polaris".

On the report of a board of officers composed of Commanders G. C. Remey and G. W. Sumner and Lieutenant-Commander H. H. Gorringe, the Secretary of the Navy awarded to the owners of the Ravenscraig, Arctic, Intrepid, and Eric, compensation for the subsistence they had supplied; to Captain Allen, the sum of $800; to the owners of the Ravenscraig, a gratuity of $500, and to each of her men who walked on the ice to rescue Captain Budington's party, $25: also, to Captains Bartlett, Adams, Soutar, and Walker, $300 each. The Captain of each vessel was informed by the Department that he was at liberty to purchase a gold pocket chronometer, and to have inscribed thereon that it was "a token of the gratitude of the United States for kindness to the officers and men of the Polaris." The thanks of the Government were also expressed to the officers of the State and the Inman Lines of Steamers.



XXI.

CHAPTER XXI.

1872. October.

The narrative returns to the party left upon the floe, the situation of which has already been given. They were busily employed in removing to a place of safety the provisions and stores which had been hastily and indiscriminately thrown upon the ice. Captain George E. Tyson, assistant navigator, had taken the direction of this work, and it had been carried on with activity and success.

When the ship disappeared, the broken pieces floated off, carrying on them men, stores, provisions, and records. The boats were at once launched, and, in the midst of perils and sufferings, these men were taken off and brought back to the main floe; as the night was too dark and tempestuous to risk further the lives of the men, the articles remaining on the drifting ice were abandoned. There was a blinding snow-drift caused by the gale from the S W.; it was impossible to move about. After working on the floe till midnight, the crew, with the Esquimaux men, women, and children. huddled together

1872. October. under the insufficient protection of some musk-ox skins. In the morning, it was discovered that the great floe had been broken by heavy icebergs, but fortunately, the piece upon which the people had taken refuge was very much the largest

This party consisted of the following nineteen persons:

George E. Tyson, assistant navigator.
Fred. Meyer, meteorologist.
John Herron, steward.
William Jackson, cook.

Seamen.
- J. W. C. Kruger,
- Frederick Jamka,
- William Nindemann,
- Frederick Aunting,
- Gustavus W. Linquist,
- Peter Johnson,

Esquimaux.
- Joe,
- Hannah,
- Punny,
- Hans,
- Hans' wife,
- Augustina,
- Tobias,
- Succi,
- Hans' baby (Charles Polaris),

The provisions, when collected, amounted to fourteen

The Separation, Oct. 15, 1872.

cans of pemmican, twelve bags of bread, eleven dozen cans of meats and soups, one can of dried apples, fourteen hams, and a small bag of chocolate. There were, moreover, the two whale-boats of the Polaris and the two kyaks of the natives, a canvas A-tent, and some instruments of navigation, including boat-compasses and a chronometer. 1872. October.

The floe had been brought up by icebergs near Littleton Island, although the land was not recognized. So near was it, however, that two of the men walked over the ice and visited McGary's Island. Captain Tyson determined to reach the shore as soon as possible, in order to secure the assistance of the Esquimaux living in the neighborhood in procuring food and shelter for his party during the winter.

The men, who had been without food since 3 o'clock of the previous day, required something to eat; a fire was made, some of the canned meat was cooked, and chocolate or coffee was imperfectly prepared. After breakfast, they took to the boats, intending to make for the land and search for the Polaris, carrying with them some of their stores, and meaning to return for the things left behind; but, in the mean time, a breeze from the N. E. having sprung up, they found it impossible to get through the loose ice, and were obliged to haul the boats up again. Soon after this, the Polaris was seen rounding a point, eight or ten miles distant, under steam and sail. Signals

1872. October. were made by hoisting the colors and by showing a piece of dark India-rubber cloth, and the motions of the ship were anxiously watched through a spy-glass; but neither the signals nor the men were seen by the Polaris. The ship stood along the shore, and dropped out of sight behind an island or a headland. This was not owing to any want of attention on the part of Captain Budington or of his officers. A careful lookout was kept on board the Polaris all day. Mr. Chester particularly says:—"I was up and down the masthead all day every ten or fifteen minutes, until we got near the land. I went up there to look for our lost parties, but I could not see them at all."

Wanting some poles for a house, or tent, Captain Tyson sent some of the men to the other side of the floe, where he knew they would be found. Here the vessel was again seen. On this being reported to Captain Tyson, he took his spy-glass, and, going to the point, thought he saw her tied up to the bay-ice. At this time the floe, which had been stationary between two grounded ice-bergs, began to drift. He determined to make another effort to reach the ship, hauling one boat across the floe, and then taking to the water; but the setting-in of the ice and the northeast gale defeated this project. He was compelled to haul the boat back on the ice, and to leave her where she was, with provisions, clothing, and a compass in her. During the night, the gale, accompanied

with snow, broke up the ice, separating the party from this boat. The piece on which they were left was only about one hundred and fifty yards across each way. 1872. October.

The gale continued through the 17th, moderating early on the 18th. They had drifted rapidly away from the land, and when it cleared, they found that they were not far from the west coast.

Before, however, the ice was sufficiently firm to afford them a passage to the land, a gale from the S. W. sprang up, which drove the small cake of ice upon which they were, rapidly toward the eastern coast. The gale continued through the 19th, but the 20th was moderately calm, with a very thick snow-storm.

Esquimaux Joe says that, after being driven near the west coast on the night of the 16th, the ice-floe party remained in that neighborhood for about two weeks, the ice being very closely packed and stationary. During this time, he and Hans visited the west-land. Early in November, the ice began to drift, and moved over toward Northumberland Island, which was passed at no great distance. They then drifted to the eastward of the Carey Islands.

Joe caught one seal on the 18th, and two on the 19th, after which, as long as these lasted, the floe party had two meals a day, consisting each of a small piece of seal-meat, the soup made from this meat, and about one

1872. October. ounce of bread. The provisions were kept in a storehouse, and served out by weight, the allowance being eleven ounces per day. The lamp, which, after the fuel gave out, came to be exclusively used for warming and cooking, was an imitation of the ordinary lamp of the natives. Their stone lamp is hollowed out like a shallow dish, with an inverted edge, on which a little moss is placed for wick, which, when lighted, tries out the oil contained in the blubber; and this is all the fire the Esquimaux have, either for heating or cooking, or for drying clothing. The lamp used by the floe party was made from a pemmican can, canvas being used for a wick. Three snow-huts were built, under the direction of Joe and Hans, by the crew: one for the crew, including an additional apartment for Captain Tyson and Mr. Meyer; one for Joe and his family; and one for Hans and his children.

On the 23d, Joe exclaimed, "I see the boat!" With the aid of glasses, it was easily made out. Immediately after breakfast, at which an extra allowance of bread was issued as a preparation, an attempt was made to recover the boat, and, if possible, the tent and bread; it was successful, and resulted in bringing back not only the boat, but two compasses, one can of pemmican, twenty-seven two-pound cans of preserved meats, and six bags of bread, containing in all probably eight hundred pounds.

On the 27th, the sun had nearly disappeared, 10′ only of its disk being visible at noon. **1872. November.**

During the remainder of the month of October, the house which had been built on the old floe was cut down and brought over on two separate expeditions; also the canvas and bags of coal which had been left there. Finally, it was determined to go back to the original floe, and, with the indispensable help of Joe and Hans, on the first days of November, everything was transported except one of the kyaks which was lost. Captain Tyson took up his lodging with Esquimaux Joe, while Mr. Meyer lived with the men.

On the 3d, the weather was thick with snow; the floe was supposed to be adrift, and the hopes of getting back to the Polaris were nearly abandoned.

On the 4th, it cleared up, and it could be seen that the floe was entirely surrounded by water, and was drifting to the southward. Mr. Meyer says, in his journal, that the party was now below Wolstenholme Sound; this seems hardly probable, however, when the short time during which the floe had been adrift is taken into account. Joe and Hans went out this day hunting, but returned without game. An addition was made to the stock of wood by recovering some, near where the big canvas hut had stood. The old allowance of three-fourths of a pound of food was resumed.

1872. November. On the 5th and 6th, the weather continued clear, the floe drifted as before, and Joe returned with a seal, which was very welcome. On the 7th, the clear weather changed to snow, and during this day and the 8th and 9th, the party were shut up in their snow-houses, with the exception of Joe and Hans, who went out hunting without success. On the 10th, the party supposed themselves to be below Carey Islands. Joe and Hans went out hunting, Joe returning before dark without Hans. Kruger and Joe went in search of him after 8 p. m., and had the good fortune to find him. He had lost his way, having left the floe in pursuit of game, and being unable to retrace his steps. When Kruger and Joe found him, they mistook him for a bear, and got ready to fire at him—a mistake into which they were easily misled by his fur clothing covered with snow, and his attitudes in climbing over the hummocks. The night was a very rough one, the wind strong, and the snow drifting; if they had not met Hans, he might have perished.

Nothing is recorded during the 11th and 12th, except the state of the weather which was variable, and the continual drifting of the floe. On the 13th, it was thick and snowing; but another load of wood was obtained from the place of the old house, and another igloo was begun for the storing of the provisions.

From the 13th to the 21st, it was for the most part clear. On the 15th, five of the dogs were shot, after suf-

fering very much from hunger; the natives not having caught many seals, it was impossible to feed them. **1872. November.**

On the 19th, Captain Tyson was quite sick with rheumatism.

The natives saw two bear-tracks and five seal-holes. On the 21st, they brought in two seals, without which it would have been impossible to have any fire; one boat had already been cut up. During this month, the darkness interfered with hunting, and on some days the total want of light rendered it absolutely impossible; besides, when heavy winds prevailed, the party was often blockaded by the snow-drifts.

The effects of exposure and want of food began to show themselves; some of the men trembled when they tried to walk; the children often cried with hunger although all was given to them that could possibly be spared. The seals brought in were received with gratitude; the invaluable success of Joe and Hans was fully appreciated; without them, the chances of life would have been very much diminished. So keen had the appetites of the party become that the seal-meat was eaten uncooked, with the skin and hair on.

On a clear day, there were three hours of light resembling twilight. Bear-tracks were again seen, but, unfortunately, not the bears themselves. At this date, only four dogs remained, and they were lean and weak.

1872. November. On the 22d Joe shot a seal, and on the 23d, Hans shot another. These two days were clear and cold, with a light north wind; the stars were visible at mid-day even when the moon was shining. Captain Tyson speaks in his journal at this time of the effect of continued hunger in keeping the mind constantly dwelling upon food.

The 28th was Thanksgiving Day, and some little addition was made to the usual allowance. A can of dried apples had been reserved for the day; to this was added chocolate and a few biscuits. These were the delicacies; but, to satisfy the cravings of hunger, it was necessary to resort to the seal, of which, without entering into details, it may be said a substantial repast was made. This was the breakfast. For the dinner, six biscuits, a pound of canned meat, one small can of mock-turtle soup, and one can of corn, divided among four persons, formed an extra allowance.

The 30th was a cloudy day, with a westerly wind. Land in the neighborhood of Lancaster Sound was seen by Meyer, bearings S. E. or S. Captain Tyson again visited the site of the canvas house to get canvas to line Hans' igloo and make it more comfortable for the women and children.

The month of December opened with clear and calm weather and a low temperature. The most important

event of the first day was the meeting of a bear by Frederick Aunting, which he did not dare to approach, having no confidence in his gun. 1872. December.

On the 2d, land was again seen. The glimmering twilight was now reduced to two hours—from 11 a. m. to 1 p. m.—appearing as a streak of light to the south. Hans was sick, and Joe went out sealing, notwithstanding the increasing darkness, but found no water. From the 3d to the 6th inclusive, the wind continued to blow from the N. W.; it was, however, very light, and the temperature ranged from —1° to —15°. A white fox, which had often ventured near the encampment, was shot on the 5th.

On the 6th, there was a remarkable display of northern lights; the luminous streamers which rose to a height of about 30°, shot up from the usual dark base at the horizon.

On the 7th, it was cloudy in the morning; toward evening the clouds dispersed. A clear sky and a well-defined ice-horizon enabled Mr. Meyer to take an altitude of γ Cassiopeiæ, which gave him the result of 74° 4′ N. as an approximation to the real latitude, and the meridian passage of the same star furnished an approximation to the longitude—67° 53′ W.

Life upon the floe was very simple. Most of the time was passed in the snow-huts. It was too dark to

1872. December. walk about, even if there had been a motive; and it was also too cold. As a matter of economy, exercise, which creates hunger, was avoided; to keep warm and still, was found to be the most agreeable mode of passing the time, and the best suited to their circumstances.

The allowance of food was given out in ounces. A day's ration consisted of six ounces of bread, eight of canned meat, and two of ham for the grown persons, with one-half as much for the children. These materials were mixed with indifferent water, and warmed over the lamp, and even this quota was more than could be well spared from the remaining stores. The measurement of the supplies was made by an ingenious contrivance of Mr. Meyer, which he thus describes:—

"I constructed a scale by connecting a fine three-cornered scale (rule) with a lever balance taken from a broken aneroid, and attaching to the ends of the scale on cords two pasteboard boxes of equal weight. The weights I formed of chamois skin and shot, taking as a unit the weight of the meat contained in a one-pound can, and successively dividing it into half-pounds, four ounces, two ounces, and one ounce."

Great reliance, however, was placed on the success of Joe and Hans in hunting. While the darkness lasted, very few seals could be caught; but it was reasonably expected that, when the period of daylight became longer,

not only seals, but bears, and foxes in their trails, would be killed. 1872. December.

The remainder of the month of December was attended with few events of interest. The weather at times was very cold, the thermometer falling as low as —26°, and rising on one day, the 21st, to 9°; the mean being about —5°.7. On the 10th of the month, the light had increased so that the thermometer could be accurately read. On the 11th, Hans, with the usual skill of a native, caught a white fox by means of a trap. The journals of these days speak of auroral streamers and coronas, and of the brilliancy of the deep winter nights.

The festival of Christmas was celebrated by an extra meal. At breakfast, an additional ounce of bread made the soup a little thicker than usual. At dinner, there was a soup made of seal's blood, a can of sausage-meat and a can of apples, half a pound of ham and two ounces of bread. Herron says, in his journal, it was the sweetest meal he ever ate. In the evening, they had their usual thin soup. The next day was very stormy; a severe gale blew, accompanied by a snow-storm with heavy drift. The latter part of the month held out the promise of better things, as Joe shot two seals, one of which he secured by means of his kyak, for which he had shouted to the men, who brought it over the floe to him. It gave them all a hearty meal for that day, and sent them to bed

1873. January. thankful and trustful. The blubber furnished fuel for warming food for the three weeks following. The month ended with calm and clear, but very cold, weather; the lowest temperature of the 31st being —23°.

The first day of the new year was sad and dreary enough. It was the coldest day as yet experienced on the floe, and the men had never been in so bad a condition for food. In one of the journals, the dinner on New Year's Day is described as "moldy bread and short allowance." Captain Tyson says in his journal, "I have dined to-day on about two feet of frozen entrails and a little blubber." And he adds, "I only wish we had plenty even of that." There was also a little pemmican soup. The weather was clear and calm. The natives went out on their daily hunt, but found nothing; there was no open water. On the second day of the month, the temperature rose a little; the wind was light and the sky hazy. On the 3d, Joe found three seal-holes; but, owing to the intense cold, he was unable to watch by them. The temperature was the same as the day before; but the wind, which was very strong from the N. W., made the cold insupportable, even by the Esquimaux. This weather continued through the 4th; but, on the 5th, the wind moderated, while the temperature remained at the same point, —24°. On this day, two bear-tracks were seen, but the animals unfortunately could not be discovered.

1873. January.

On the 6th, the day was varied by Mr. Meyer's taking the meridian altitudes of Polaris and of γ Cassiopeiæ. The approximate latitude (the declination being taken from a star-chart) given by Polaris was 72° 03′ 30″ N.; by γ Cassiopeiæ, 72° 11′ N.; the mean, 72° 07′ 15″ N.: approximate longitude by γ Cassiopeiæ (right ascension taken from star-chart), 60° 40′ 45″ W. The firewood being entirely used, the meals were now warmed necessarily by the lamp made in imitation of the Esquimaux lamp, as previously described.

From the 7th to the 13th inclusive, the weather was every day, with one exception, clear with light winds and calms; but during all this time the thermometer was very low, not rising above —25°, and descending on the 13th, to —40°. During this excessive cold, when the mercury froze, the distant land was the only thing discernible; there was no open water, and therefore no seals to be secured. The rapid consumption of the provisions, notwithstanding the short allowance on which the party had been placed, was telling severely upon the strength, spirits, and power of endurance of most of them. The situation was every day becoming more anxious, but the rapidity of the drift, as shown by Mr. Meyer's last observations, and the supposed approach to the western coast of Greenland, were hopeful, and were something of a set-off against the surrounding perils. John Herron, the steward, was so

1873. January. much elated that he treated himself to an extra pipe of tobacco, notwithstanding that his supply was getting very short.

On the 14th, the cold moderated, and the thermometer rose to 16° and 13° below zero; this diminution of the cold was accompanied by an increase of wind and drifting snow. The same weather continued through the 15th. The interesting event of that day was an encounter between the two remaining dogs and two bears, in which the latter, as might be expected, got the better of their opponents. The temperature fell again on the 16th to —31°. But this was a happy day—Hans shot a seal, which, besides the fresh food, supplied the means of creating warmth for eight days, and but for which the party would have been soon reduced to the necessity of living on three-fourths of a pound of dry cold provisions, a day. One or two of the men had a slight touch of the scurvy.

On the 17th, the calm changed to a strong wind from the N. W., with thick and drifting snow; the thermometer fell to —35°. On the next day, the weather was in general the same; but, on the 19th, it cleared up, and the great event occurred of the sun's re-appearance after an absence of 83 days. His return not only brought the cheerful light of day with all its good effects upon health and spirits, but a better assurance of safety by the aid which it gave to the hunters on whom the party depended

for the means of their subsistence. The sun would have been seen the day before but for the interposition of huge icebergs. **1873. January.**

Another happy event was the killing of two seals, one of which was secured by Joe and Hans, who were obliged to go about six miles to the open water. Many other seals were seen. The Esquimaux had previously said, that, although they had often suffered before for the want of food, they had never encountered so severe an experience as that through which they were passing.

During the remainder of this month, the circumstances of the party on the ice-floe were improved by the frequent successes of Joe and Hans in taking seals; they caught one seal on the 23d, one on the 24th, and one on the 26th. These were the most important events during this period of eleven days The temperature was very low, the mean being 35° below zero, and the extreme being at and below the temperature of freezing mercury. Of the dogs, but one remained. On the 27th, Mr. Meyer determined his position in the same manner as before, and obtained the latitude of 69° 32′ N. and the longitude of 60° 03′ W.

Poor little Tobias, one of Hans' younger children, who had been sick for some time, was becoming worse; being an Esquimaux, he could eat seal-meat, but he refused pemmican; his condition excited compassion.

1873. February. The first two days of February were dismal indeed. The wind blew with violence from the north and west, the snow drifted heavily, and the temperature varied from —16° to —22°. The floe-party had nothing to eat but their scanty allowance. The Esquimaux could find no water, and, therefore, no seals, and the sufferings of the children from hunger were painful to witness. The third and fourth days were not much better, except that the northwest gale abated, and the thermometer on the 4th, rose to —10°. On the 5th, the weather again moderated. The wind came from the southward and westward, and Hans brought home one seal; he had shot two others, but lost them in the young ice. This providential relief restored in some measure the spirits of the party; one of them observes in his journal that the seals seemed to come at the moment of extreme necessity. This animal was a very litttle one, but he furnished them the best meal which they had known for many days. Captain Tyson gives an account of the manner in which this seal was secured. There was no water, but young ice only, through which the seal had thrust his head, and thus afforded Joe the opportunity of shooting at the animal which was at a distance of sixty yards from the firm ice. Then Hans got into the kyak, and Captain Tyson giving him a start by pushing it on to the young ice, he worked his way by sticking his paddle into the ice, and by violent motions of

the body. The ice would have broken under the tread of a man, but it sustained the weight of a kyak with a man in it. In this way, he reached the seal, and having made a line fast to its head, he returned to the shore, working his way in the same manner. When he landed, he was perspiring freely, the thermometer standing at —17°. 1873. February.

Mr. Meyer by an observation of the sun determined the approximate latitude to be 68° 50′.

On the 6th, Joe and Hans renewed their hunt, but in vain; there was a heavy snow-drift, and the temperature rose to —5°. The 7th was a fair day, with a moderate wind, and Hans, by good fortune, again shot a seal. Narwhals were seen and fired at; one, large enough to have furnished a month's supply of food, was killed by Joe, but immediately sank. It appears that this was their time for going north.

From the 8th to the 12th the wind was very fresh, and accompanied by thick and drifting snow. Many narwhals were now seen daily, and several were shot, but none secured. On the 10th, Joe caught two seals. Kruger, who had been ill with the diarrhea, was recovering; Mr. Meyer was taken with the same disease.

The day now lasted eight hours—from 8 a. m. to 4 p. m. The 13th was another cold day, with the wind blowing a gale from the N. W., accompanied, as before, by snow-drift. The natives went out hunting; Joe

1873. February. returned empty-handed, but, on the next day, Hans caught a seal; and a fox was seen near the huts, not, however, within range. The 15th was cold and stormy, and the same may be said of the 16th. On the morning of the 17th, Captain Tyson, with Joe and Hans, set out on a hunt at sunrise. Hans had the good fortune to kill a seal when it came up to its water-hole; it was soon skinned and dressed, and, though small, was very welcome; three dovekies, weighing about four ounces each, were also shot. On the 18th, a constant gale from the west, and drifting snow still continued, so that there was little chance for the hunters. On the 19th, the west coast was in sight. It was a pleasant day, and Captain Tyson, with Joe and Hans, again set off to hunt, Joe shooting the only seal which was seen; it was small, but each share of it, when served out, was accompanied by the tenth of a pound of bread. On the 20th, eleven dovekies were shot. On this day, there remained only two bags of bread and three cans of pemmican. The time was fast coming when Hans and Joe would be the sole dependence for the means of supporting life.

On the 21st, the thermometer rose above zero for the first time since the beginning of the year. One seal and two narwhals were seen, but none of them could be secured. On this day, the second meal consisted of a dovekie and a piece of blubber. The situation became

every day more alarming. Captain Tyson mentions an incident which displayed the loss of strength consequent upon their privation and suffering. He shot a seal about a quarter of a mile from the quarters. Several men who helped to bring forward the kyak were overcome by the exertion; yet the kyak is so light that it can be easily raised from the ground by one man in ordinary health. Nindemann shot two dovekies; he fell through the ice in securing them, and had to swim for it. About this time, preparations were made for an attempt to reach the land, which was finally abandoned. The daily rations were reduced to seven ounces, so that the supplies might hold out till April. **1873. February.**

The 23d was stormy; the wind at the N. W., with snow. The temperature was regarded as even warm; it was 26°.

On the 24th, it would have been impossible to move, even if the purpose of reaching the land had not been given up. The light snow which had fallen in the night seriously obstructed traveling, and made it impossible to drag the boat. The estimates of the distance from land differed: some supposed it to be thirty miles off; others, twenty. If the Esquimaux had been left to follow their own counsels, they would have started for land as soon as seen. The men appear to have been very grateful for their invaluable services, and acknowledged that they

1873. March. owed to them, under God, their lives and good health. Joe caught a small seal this day again, making the eighth this month. The unusual brilliancy of the northern lights is mentioned in one of the journals.

From the 25th to the 28th inclusive, the condition of the party was constantly growing worse. Some seal-holes and seals were seen, but none of the animals were taken. At one time the temperature went below zero, but rose again with the sun.

The provisions were again reduced one-half—to a few ounces a day—the smallest quantity with which life could be sustained. A bear-track was seen on the 28th, but it was lost where the animal broke the ice and swam across a crack. On the same day the eyes of the sufferers were gladdened by the sight of thirty-seven dovekies, brought in by the hunters. Two were given to each of the men, and one apiece to the children; everything was eaten but the feathers; with these dovekies no bread was served out.

The month of March opened with great severity. On the morning of the 1st, the thermometer was 34° below zero. Notwithstanding this, the sportsmen went out and shot sixty-six dovekies. This sounds a great deal better than it really was, for it took twenty or thirty of those birds to make a moderate meal. They are not like the seal, calorific; but they saved the bread.

"Peter (Johnson)", says Herron in his journal, "favors us with a sailor's yarn when we lie down at night, provided we have had a meal of seal-meat; on other nights, we are quiet enough." Joe wasted powder and shot on some narwhals, failing, as usual, to kill them. **1873. March.**

The thermometer still continued low, having gone up to —31° on the 2d of the month; but the day was marked by a very happy event. At 5 p. m., Joe shot a large ookgook, measuring nine feet including the hind flipper, the only one of the species seen that day. The help of all the men was required to bring him home. Dragging the animal to their quarters, and thanking God for his mercy, made the occupation of that Sunday; this valuable accession to their stores caused every one to feel well and happy. Hannah had only two small pieces of blubber left for her lamp for two days, and Hans had only enough for one day when this monster was taken, which, it was estimated, would yield thirty gallons of oil.

It began to blow in the evening, and the next day a strong wind from the N. W. prevailed, with thick weather and drifting snow; even the natives could not go out, but, happily, there was no necessity for so doing, for they were well supplied, and could rest many days without the fear of starvation. It was very natural that, after such long fasting, the men should indulge their appetites freely,

1873 March. too freely even for their health and comfort, especially as they ate ookgook only, the bread and pemmican being judiciously reserved. Those suffered most who ate the liver of the animal, of the consequences of which they were warned by Captain Tyson. Most of them were sick for a week, and lost the skin of their faces, hands, and chests. Since all this feasting was done inside the snow-houses, it was not strange that the latter were smeared with blood. So crazy were the appetites of the men that their hands and faces were soon covered with blood, and the party are described as looking more like carnivorous animals than human beings. Among the different modes of preparing the food, a favorite one was making a species of sausage-meat. The mammary glands of the female seal, distended with the milk, were very delicate eating. With the possession of the ookgook, they now ventured again on a second meal, which consisted of part of the forty-two dovekies shot on the 2d.

On the 4th, the thermometer stood at sunrise at 31°. Although it was clear, no land was seen to the westward; a few dovekies were caught. The next day brought a gale from the N. W., with drifting snow, and this did not abate until the morning of the 7th. Great difficulty was experienced in keeping warm and in making the frozen meat sufficiently soft to be cut up for cooking. This terrible gale, which seems to have been more severe

than any hitherto encountered on the ice and which, as before said, continued through the whole of the 6th, so completely deprived the party of the power of moving about as to give them even a deeper sense of the providential supply furnished by the ookgook, without which they would have been stinted to a short allowance of bread and pemmican, and that, cold. **1873. March.**

On the morning of the 7th, the weather had improved, and the sun shone brightly, although the snow was still drifting under a strong breeze. The floe was surrounded by insecure icebergs, and, during the whole of the night, the sounds proceeding from its cracking and working were like those of artillery, preventing sleep. The ice seemed likely at any moment to break into pieces. Joe and Hans went out in search of open water and found one small hole in which they shot two dovekies. Pleasant weather came at last on the 8th; yet no water or game could be found, although searched for by the natives. On the next day, the thermometer rose from —30° to —13°, and, on the 9th, to —10°; both of these two last days were calm, and Joe had his usual good luck on the 9th, in catching a seal.

On the night of the 10th, the cracking of the floe in all directions was so alarming that the people remained up and dressed, and kept themselves and all their necessaries of life ready, in case of a sudden disaster.

1873. March. On the next day, it was ascertained that the pack was breaking up. It was a fearful time; it was impossible to see anything on account of the snow-drift, but, from the violent motion of the piece on which the party was floating, it was known that the floe had broken.

The night of Tuesday, the 11th, was one of extreme peril and apprehension. The creaking and breaking of the ice, the roaring of the gale, and the swashing of the water continued until 1 o'clock in the morning, when the gale began to moderate. When daylight came, it was distinctly seen that everything was broken up all around them, and that they were on the best piece of ice, which was in size about one hundred by seventy-five yards. A dreadful night was passed in the momentary expectation of this small piece being further diminished. Fortunately, the place originally selected for the snow-houses, proved to be the thickest and most solid part of the floe; the boat still remained uninjured. The wind, however, now moderated. The work of commotion and destruction had lasted for sixty hours, during all of which time it was impossible to see at a distance of ten yards; but, at last, the wind calmed down, and pleasant weather returned. Joe shot two seals, and Hans and Captain Tyson each, one; Joe also caught three dovekies, and the cook two.

The gale returned on the 13th, and although the tem-

perature was warmer, no attempt was made to hunt; it would have been rash to leave the piece of ice on which the huts stood. Mr. Meyer, on the preceding day, gave for the determination of latitude, 64° 32′ N. which placed them opposite Cumberland Gulf. The diminished floe drifted along quietly surrounded by the icebergs which had accompanied it all winter. It is very striking that throughout all these exciting and dangerous events no accidents occurred and all kept well; even Tobias, Hans' little boy, improved. **1873. March.**

The night of the 13th was stormy; but, on the 14th, the day was very fine, with a light south wind, and the morning sun shining brightly. Joe killed an ookgook, which was not quite so large as the first; it was found to be with young; he also caught two more seals. The latitude by Mr. Meyer's observation was 64° 19′ N.; the temperature rose to 10° above zero.

Two days now passed without any incidents of interest; seals and narwhals were seen, but none were caught; the thermometer varied from six to ten degrees below zero at night, and rose from two to five degress above zero in the day-time: all the party continued well.

The quiet of the 17th was varied by an exciting pursuit of a bear, which lasted for two hours, when he separated himself from his pursuers by swimming over a large space of water. It was seen by the tracks, that the bears during the night had been within twenty paces of the huts.

1873. March. The latitude at noon was 63° 47′ N., which showed a drift of 32 miles in three days.

From the 18th to the 20th inclusive, no game was taken except a small seal shot by Hans on the 20th. The wind blew steadily from the N. W., and it was very cold, the thermometer falling to —18° and rising again to 18°. During this period, there were several displays of the northern lights, two of which were quite remarkable.

On the 21st, the wind became light from the north; Joe and Hans had a lucky day at sealing. The hole where the seals were found was two miles off, and they traveled to it over the newly-formed ice, carrying the kyak with them; Hans caught one seal, and Joe six. This was the last day of winter.

Joe caught two seals on the 22d, which was a very fine day, but on the next day a strong wind from the north confined the party to their huts; the thermometer descended to 5° below zero. On the 24th, bear-tracks were discovered in the neighborhood of the huts, and they were now frequently seen. One seal was shot on that day and two on the next; and on the 26th, nine large bladder-nose seals were killed, of which five sank; of the four saved, Joe shot three and Hans one. There was now meat enough for eighteen or twenty days.

This success in collecting food raised the spirits of the party very much. They knew they had gotten on the

expected seal grounds, where an abundance could be obtained, and of a larger species than those on which they had been living. **1873. March.**

A very agreeable surprise came upon them on the evening of the 27th. Joe, when about getting ready for his night's rest, heard a noise, which at first he thought was made by the breaking-up of the ice; he went out to ascertain what it was. In a very short time, he came back looking pale, and saying, "There is a bear close to my kyak." The kyak was within ten feet of the entrance to the hut. Both Captain Tyson's and Joe's rifles were outside, one lying close to the kyak and the other inside of it; but Joe had his pistol.

They crept out cautiously, and, when they got to the entrance, could distinctly hear the bear eating; there were several seal-skins and a good deal of blubber lying around in all directions, and the bear could be seen eating the skins and blubber, which he had hauled off. Joe crawled into the hut of the crew to give the alarm. Captain Tyson crept stealthily toward his rifle, but, in taking it, aroused the attention of the bear; the captain pulled the trigger three times, but the gun did not go off, and the bear, taking the alarm, came toward him, when he retreated into his hut. Reloading his rifle, and putting extra charges in his pocket, he again crept out, and fired with such good aim, notwithstanding

1873. March. the darkness of the night, that the ball entered the left shoulder of the bear, passed through the heart, and came out on the other side. It proved to be a large, fine animal, of which every part except the liver was good; the meat tasted like pork. The animal caught was what is called the sea-bear (*Ursus maritimus*); it is almost amphibious; its food consists principally of seals, captured either on the ice or in the sea.

It may seem strange to the reader who has had no experience in arctic travel that the guns should have been left outside of the igloos; it may be said, therefore, by way of explanation, that the exhalations and condensations inside, formed moisture which would have ruined fire-arms unless they were cased; and there were no cases.

On the night of the 28th, a heavy gale sprang up from the N. W., and drove before it huge bergs, of which there were at least one hundred; the floe was hemmed in by them. One struck it, and, after thumping on it for a while, finally passed by, without inflicting serious injury.

On the evening of the 30th, two seals were seen on a piece of ice, and shot at from the floe. The boat being launched and pulled out to the smaller piece, it was discovered that they were a large male bladder-nose seal, and a female with her pup. She showed fight, but was soon

killed, and, with her pup, towed to the floe; the buck also was shot, but got under the young ice. Hans, later in the day, shot another young seal. When the young of the seal is secured without shooting, it is the practice to crush it to death with the foot, in order to save not only the blood but the milk in its stomach, which is regarded by the Esquimaux as a delicacy. The bladder-noses frequently offer resistance, but they are helpless against bullets. **1873. March.**

On the last day of this month, a seal and two pups were killed by Joe, and one pup by Hans; these were caught on the drifting ice. The floe became gradually smaller, and was sometimes separated from the pack, leaving the open ocean on the eastern side. Its position was assumed to be opposite Cape Farewell; the latitude was 59° 41′ N.

At one time during the night of the 30th, the sea was very heavy, and no ice could be seen as far as the eye could reach. On the 31st, the ice closed around, but leaving a great deal of open water. The drift for the five last days appeared to have been at the rate of twenty-three miles per day, the wind having been from the west. The thermometer ranged from 9° below, to 20° above zero.

The 31st was a day of great anxiety and peril. Although the floe was constantly diminishing, the appear-

1873. March. ance of heavy weather made it unsafe to venture in the open boat. The party could only suffer and hope for the best.

XXII

CHAPTER XXII.

On the 1st of April, it was necessary to abandon the floe, which was now wasted to such an extent that it was no longer safe; at 8 a. m., therefore, the party took to their boat. Finding her loaded too deep, they threw overboard one hundred pounds of meat and nearly all of their clothing; the most that could be carried was the tent, a few skins for protection, and a little meat, with the bread and the pemmican. It should be remembered that this boat was intended to carry six or eight men only, and that at this time she had in her twelve men, two women, and five children, with the tent and skins, and some provisions. There was so little room that it was difficult to handle the oars and yoke-ropes. Great pains were taken by Captain Tyson to preserve Captain Hall's writing-desk. After making fifteen or twenty miles to the south and west in the pack, a landing was effected at noon, and the tent was pitched, with the intention of remaining all night. A young seal was caught and the

1873.
April.

1873. April. afternoon was spent in making canvas washboards for the boat. The weather was remarkably fine, and continued so all night. But there was very little sleep, partly on account of the cold, partly on account of the breaking-up of the ice; the floe lost several pieces.

An early start was made at 5 a. m. of the 2d, the weather being then very fine and calm. Two hours afterward, a breeze sprang up, increasing until it blew very fresh from the southward and westward, the course on which the boat was pulling. It was necessary again to haul up and encamp, but several narrow escapes were made before a piece of ice could be found on which it was safe to land. By this time the boat was fast making water; when emptied, a hole was found in her side and repaired. A seal was caught, which furnished supper.

On the 3d, the early morning was spent in further repairing the boat and fitting the canvas washboards. At 8.45 a. m., she was launched, and the party again started, in a calm. At the end of three hours, a breeze sprang up from the N. N. W., but the boat kept under way until half past two; being then beset by the ice which was impenetrable, she was hauled up, and the party encamped for the night. At this time, seals were so easily caught that no apprehension of suffering from want of food was entertained.

Although the wind was from the northward and

westward, and, therefore, favorable for reaching the land, it was impossible to get under way on the 4th, until a quarter before 9 a. m. After a good run of two hours, the party was again beset by the ice, and obliged to haul up, having regained the pack. The piece on which they landed was so heavy and appeared to be so compact that they considered themselves out of immediate danger; the struggle to reach it had been very severe and very fatiguing. **1873. April.**

On the 5th, the wind blew a gale from the westward, and there was a fearful sea running. At 5 a. m., two pieces broke from the floe, and it was necessary to haul everything further back toward its center. Another piece, breaking off, carried away Joe's hut; fortunately, the cracking of the ice gave warning in time for the inmates not only to escape, but to save some of their effects. The journals describe this as a dreadful day, in which nothing could be done to lessen the danger or discomforts, yet Joe speedily built another hut. A watch was set for the night—a night of continued and patient suffering.

On the 6th, the wind shifted to the N. W., still blowing a severe gale; the party remained on the same ice, from which indeed there was no escape, for the sea was too rough to launch the boat. Joe again lost his igloo by the opening of the ice, which split with a great noise, cutting the hut in two. A piece of ice was left so

1873. April. small as to afford footing only. It was impossible to lie down. The things were put into the boat and all hands stood by for a jump.

The weather and the sea remained the same throughout the 7th. At 6 o'clock in the morning, the ice split across the tent while the men were getting out a few ounces of pemmican; they saved themselves, but came near losing their boat, and actually lost their breakfast. It was impossible to catch a seal after the storm set in. There was no blubber to feed the lamp, and, therefore, there was no water to drink. The prospect was gloomy indeed. Half of the men lay down in the tent to get a little rest, while the remainder walked around it; but for those who attempted to rest the body there was no reposé for the mind. One after another would spring up from his place and make a wild dash forward, as if to avoid some sudden danger.

At midnight of the 8th, the ice broke between the tent and the boat, which were so close that there was not space to pass between them. Mr. Meyer, with the boat and the kyak, was separated from the rest of the party. The weather was the same as before—blowing, snowing, and very cold; the ice was cracking and grinding with a very heavy sea. Mr. Meyer cast the kyak adrift, in the hope that it would reach the other part of the floe, and that Joe or Hans might come in it to his assistance; but it

drifted away to leeward. The natives took their paddles and ice-spears and went after it, springing from piece to piece, until, by propelling a small piece of ice, they got near enough to Mr. Meyer to catch a rope which he threw them, and with which he dragged them toward him. In the mean time, those who remained behind, watched Mr. Meyer and the natives with the extremest anxiety, and could just make out through the darkness that they had reached him. Nothing more could be done during the night; it was necessary to wait for daylight, which happily came at 3 a. m. On remembering that it was impossible for the three to manage the boat by themselves, others determined to join them. In order to do so, they were obliged to make the same perilous journey. This they accomplished in safety, and brought the boat back, after a long struggle, to the original floe; the kyak also was saved. Mr. Meyer and Jamka had fallen into the water during the night, but luckily there were two or three dry shirts for them. All of the men were more or less wet; Mr. Meyer, having been very wet all night, came near being frozen to death. He lost his breath for some time; but Joe and Hans, laboring diligently, succeeded in rousing him from his lethargy, and finally he was restored to full consciousness by violent exercise. Shortly afterward he found that his toes were frozen. **1873. April.**

The tent was now taken down and again pitched in

1873., April. the middle of the small floe, with the boat alongside; Joe built another hut near them. The breakfast that morning consisted of a few morsels of pemmican and bread. A watch was set to observe the movements of the ice; the rest of the party lay down in a state of extreme weariness, to get some much-needed sleep.

The next twelve hours of the 9th, proved a season of rest; the sun shone out for a few moments, long enough for Mr. Meyer to determine the latitude which was, approximately, 55° 51′ N. The sea again rose high toward evening, the ice became more loose, and the water approached nearer, threatening every moment to wash the people off. Finally, in the evening, they were washed out of their tent and igloo. Although the boat could not possibly have lived in such a sea, it was got ready, and the women and children placed in it for safety. There was not a dry place to stand on, nor a piece of fresh-water ice to eat, the sea having swept over everything, and filled the depressions where fresh-water ice was sometimes found. At midnight, the ice had closed up, and the wind and sea subsided.

The morning of the 10th was calm, cloudy, and warm, although the sun had not appeared. This weather continued through the 11th, bringing with it the encouragement of seeing a fox, some crows, and land-birds, from which it was inferred that land was not distant. It

was fortunate that the weather was calm, for there were two large bergs nearly on the top of the party, by which in any motion of the ice they might have been crushed. The light wind and calm continued throughout the 12th, while the party still remained prisoners, suffering very much from hunger. Seals were seen, but could not be reached. The day was very fine, and the sun, shining for the first time in several days, gave Mr. Meyer an opportunity of determining the latitude, 55° 35′ N. **1873. April.**

The ice opened at night, and closed again; it was also open for a few hours Sunday morning. The northern lights had been remarkably brilliant. Mr. Meyer's observations for latitude gave 55° 23′ N. Seals were seen, but the prisoners were not able to approach them. On the 14th, the pack remained closed; the men were again tantalized by the sight of seals. The weather was fine, and the sea, or rather the ice, was still. The latitude was 55° 13′ N. The piece of ice was fast wearing away, and the provisions were nearly exhausted. The future looked very dark; starvation stared them in the face.

The weather still continued calm on the 15th; the condition of the ice was unchanged. The night before had been very cold, and snow had fallen; it was thought that a change of weather was about to take place. But during the day the sun shone brightly. It was still impossible to move. The latitude was 54° 58′ N. Mr. Meyer's suffer-

1873. April. ings from hunger were no doubt aggravated by his terrible exposure on the 8th; he lost strength, and his appearance indicated the severity of his trials.

On the 16th, the wind increased, but not enough to create any swell. The heads of several of the men were terribly swollen, but, according to Captain Tyson, not from scurvy. The length of the night-watches was reduced to an hour; the men in their present weak condition could not keep up for a longer time. The demoralizing influence of the situation began to show itself in one or more of the men while on watch stealing the pemmican—one of them had been caught in the act on the 7th.

It was now the seventh day of their imprisonment in the ice without change of condition or power of motion, while the scanty supply of provisions was rapidly coming to an end. Small as was the allowance, it was now necessary to reduce it still further. The men were growing rapidly weaker and the horrible idea of having to resort to the last means of subsistence entered their minds.

The next day, the situation was unchanged in every respect, except that the swelling of the heads had increased; individual weakness was more apparent.

The morning of Friday, the 18th—a day never to be forgotten by the shipwrecked sufferers—opened with a light breeze from the north. At 10 o'clock Joe saw a

small water-hole about half a mile off. Taking his gun, he ventured to cross over on the loose ice. As soon as he reached the hole, the sound of his rifle was heard—he had killed a seal. He then shouted for his kyak, as the water was rapidly making. An hour of intense anxiety passed before the kyak could be got to him, but when, after great trouble and risk, it arrived, a seal was secured of sufficient size for three meals for the whole party. It was eaten raw and eaten with thanksgiving, for it saved them from starvation for some days at least. Carefully dividing it into sixteen parts in which nothing but the gall was rejected, one man turned his back and called the others in succession, each one taking his share of meat, blubber, and skin, when his name was pronounced. Then a general contribution was made of blubber and rags for a fire, with which soup was cooked, and eaten with much relish. **1873. April.**

The seal was not their only visitor. A crow, two small birds, and a large flock of ducks, perhaps numbering a hundred and fifty, approached, but kept out of the range of their guns. A still more grateful experience was a sight of the land in plain view in a southwest direction.

On the 19th, the circumstances had changed very little, except that there was an increasing swell and a loosening of the pack. The weather was thick. No land was to

1873. April. be seen, and there was no appearance of the sun. Toward evening, the sky was threatening, the wind rose, and the swell became more heavy. At 9 p. m., a sudden alarm was given by the man on watch, and instantly a sea struck the floe, and, washing over it, carried away everything that was loose. There was barely time to put the women and children and some few things into the boat, before a succession of seas followed at intervals of between five and ten minutes. At last, there came a still larger wave, which carried away the tent, the skins, and most of the bed-clothing.

The one object now was to save the boat on which the lives of the party depended. To do this, it was necessary for the men to stand on each side of the boat and hold on with all their strength. The attempt was made to secure it by the boat-warp and by a strong line of strips of ookgook skin, which were fastened to projecting points in the ice, but these frequently parted, and the safety of the boat wholly depended on the exertions of the men. Every fifteen or twenty minutes a sea came, which lifted it, and carried the men with it, to the opposite edge of the ice, where the sea lost its strength. The interval between the seas was passed in getting the boat back to the weather edge of the floe—the edge on which the sea struck first.

To add to the sufferings of the night, the water was

filled with blocks of ice, which, continually flying about, struck the men while holding fast to the boat, inflicting severe bruises on every part of the body. In this situation, they stood from 9 o'clock in the evening until 7 the next morning. **1873. April.**

The only words that were spoken were words of encouragement to each other—"Hold on"—"Bear down"—"Put on all your weight".

At 7 a. m. of the 20th, a small piece of ice, which rode dry, came close to them, and they made up their minds to launch the boat, and reach it or perish. The cook fell overboard, but was saved. All landed in safety, wet, weary, cold, and sleepy, but grateful for their preservation.

The first object then was to dry the clothes, which could be done only to a limited extent, the sun not being out and the atmosphere being damp. The men were divided into two watches, and slept in the boat as well as they could. The ice around them was posh-ice, through which the boat could not be forced; it was necessary to remain where they were. The fatigue and dangers encountered on the preceding night could never have been borne but for the three meals furnished by the last seal shot by Joe. The latitude was now 53° 57′ N. The weather was very bad; at first it snowed and was sleety, after which it rained all night, and until 12 o'clock next day.

The dawn of the 22d found the men half-drowned,

1873. April. cold, and without shelter. There was nothing to eat; one of them chewed on a piece of tanned skin which had been saved for clothing. Joe had been three times out on the ice, but had seen nothing. The faithful and untiring Esquimaux ventured out a fourth time, and, while anxiously watching from the top of a hummock, he saw a bear coming toward him. He hurried back for his gun; all hands were directed to lie down and remain perfectly still. Joe and Hans went toward the animal, and waited for him behind a hummock. It was a moment of intense excitement. The bear came slowly on, and, when within range of the rifles, two shots were fired, killing him instantly. The men arose with a shout, rushed to the spot, and, bending on a line, dragged him in triumph to the camp. His blood was very acceptable, for they were suffering with extreme thirst. The bear was further south than the animal usually comes; his stomach was empty and he was quite thin, but his flesh was all the better for this, since when he is fat it is gross and very strong. After all the previous escapes, but for the rifles of the Esquimaux in this extreme emergency, this story would not have been written.

During the next two days, the weather was dismal; it rained hard, everybody was drenched, and it was impossible to move. Glimpses of the land were obtained from time to time when the weather held up, and a prom-

ising lead of water at one time showed itself, which, however, soon again closed. A large flock of ducks was seen on the morning of the 24th. A gale sprung up from the N. E., which continued to the 25th. Under these trying circumstances, the bear-meat kept them alive, every one, especially Mr. Meyer, being strengthened and improved by it; but, though tender and good, it was not equal to the seal-meat for generating heat. **1873. April.**

At 5 a. m. of the 25th, a determination was formed of attempting to get to the land in the boat, although it was badly damaged, and there were no means of putting it in repair. The piece of ice on which they were, had wasted so much that it could not ride out another easterly gale; it would certainly be broken up into pieces not affording even a foothold.

Notwithstanding the gale, the fearful sea, and the crippled and overloaded condition of the boat, eight hours of almost fruitless labor were spent at the oars, when the party hauled up on a floe, and made preparations to camp for the night. The sky had been for some days entirely overcast; neither the sun nor a star had been seen; yet the men were very much encouraged by finding themselves on sealing-ground. They saw seals in the greatest abundance, moving like porpoises in schools; in the evening, Joe shot some which sank, but he finally secured one; on the morning of the 26th, Hans shot another.

1873. April. In the morning, the weather was so fine that the party, notwithstanding the compactness of the ice, was tempted again to take to the boat, but at the end of two hours, it was so beset that it was necessary to haul up on a small piece of ice—the best that could be found. It had been snowing during the day, but the weather again cleared up; the boat was repaired, and some of the clothing was dried. Hans shot another seal.

The 27th proved to be a day of disappointment. There was open water in sight, but it was inaccessible. Mr. Meyer's observation of the preceding day had given the latitude of 53° 30′ N. During the night, a gale arose from the west, and brought on a heavy sea which, washing over the floe, compelled the men again to stand by the boat all night. But it was not nearly so bad as that on the night of the 19th. The boat was launched at daylight of the 28th, but, after some ineffectual struggles, it was necessary to haul up again on the ice at 6 o'clock. Here they had a few hours' sleep, until they were in danger of being crushed by some bergs which were coming down upon them with fearful noises caused by their collisions. The gale had set everything in motion, but, in the midst of this chaotic confusion, Joe shot, out on the ice, three young bladder-nose seals which, not being large, were taken into the boat.

At 4.30 p. m., a steamer hove in sight, right ahead,

and, at one time, appeared to be bearing down upon the boat. The American colors were hoisted, and the boat pulled for her. She was recognized as a sealer steering southwest, and apparently working through the ice. For a few moments the hearts of the shipwrecked party were thrilled with joy, but the steamer failed to see them, and, night coming on, she soon diappeared. The boat was once more hauled up on a piece of ice. The night was calm and clear and the sea smooth. Fires were made on the floe with the blubber of seals, to attract the attention of passing vessels. The party was divided into two watches, of four hours each; but the hope of relief had made them more wakeful than the fear of danger. During the day, some westing had been made. 1873. April.

The morning of the 29th was pleasant and calm. Every one was on the lookout for a steamer, except those who were making up for their night's watch. At daylight, a steamer was seen 8 miles off. The watch below was called, the boat launched, and headed for the ship, but after pulling two hours, it was so beset by the ice that it could make no headway. The party landed on a small piece of ice, hoisted their colors, mounted the highest point of the floe, collected all the rifles and pistols, and fired them together to attract attention.

After three rounds, the steamer fired three shots, and, changing her course, headed toward the floe. The

1873. April. party uttered an involuntary shout, though too far off to be heard. Shortly after, the steamer again changed her course, heading first south, then north, and then west. The firing by the party was repeated several times, and every possible effort was made to attract attention, but in vain. Late in the afternoon, she steamed away to the S. W., and the hope of relief was reluctantly abandoned. In the evening, she was seen again, but further off. This vessel was the Eagle, of Saint John's, Captain Jackmann, an officer noted for his humanity; he had received two medals for saving life, and had he seen the party on the floe, he would have come to their assistance at any hazard.

While looking at the Eagle, another stranger hove in sight, strengthening the hope of final relief.

Again early on the morning of the 30th when the fog opened, a steamer was seen close to the floe; the guns were fired, the colors were set on the boat's mast, and loud shouts were uttered. Hans shoved off in his kyak, of his own accord, to intercept her, if possible; the morning was foggy, but the steamer's head soon turned toward them, and in a few moments she was alongside of the floe. The three cheers given by the shipwrecked people were returned by a hundred men on deck and aloft. The vessel proved to be the barkentine Tigress, sealer, Captain Bartlett, of Conception Bay, Newfoundland. Her small sealboats were very soon in the water; but the shipwrecked

party did not wait for them. They threw everything out of their own boat, launched her, and in a few moments were on board the Tigress, where they became objects of extreme curiosity as well as of the most devoted attention. When the time during which they had been on the ice was mentioned, they were regarded with astonishment, and warmly congratulated upon their miraculous escape. They were picked up in latitude 53° 35′ N., off Grady Harbor, Labrador. **1873. May.**

The next day, May 1, Captain Bartlett had all his boats out sealing; Joe joined them, and was a happy as well as an able assistant. From the evening of the 2d, to the noon of the 4th, a storm of extreme severity raged incessantly. The floe party had been rescued in good time; it could hardly have survived this gale. Even the staunch and well-found Tigress, fitted especially for this service, encountered such rough treatment from the ice as excited the astonishment of the rescued seamen.

The return to civilized life and its food and comforts was attended with the usual results. Most of the men suffered at first from swollen legs and feet, diarrhea, and severe headache.

On the morning of the 2d, Captain De Lang, of the sealer Walrus, came on board the Tigress, and was informed of the rescue of the floe party and the circumstances attend-

1873. **May.** ing it. He expected to return to Newfoundland before any other vessel of the fleet, and actually did so, furnishing to Mr. Mulloy, United States consul at St. John's, on the 9th, the first information of the safety and condition of the rescued Americans. This information was telegraphed by the consul the same day to the honorable Secretary of State, the telegram containing the first news also of the death of Captain Hall.

Captain Bartlett decided, on the 7th, to return home; on the 8th, instead of going to St. John's, as was his first intention, he put into Bay Roberts, in order to land his boats and sealing-gear, preparatory to the ship being hauled out at St. John's for repairs.

Mr. Mulloy, United States consul, on the 9th, went to Bay Roberts, and obtained from Captain Tyson a brief statement of the incidents of the voyage of the Polaris, the separation on the 15th of October, 1872, and the drift of the floe party; all of which he communicated by telegraph, on that day, to the Secretary of State, adding that the party were well provided for in Bay Roberts, and that they would come to St. John's on the following Monday.

On Monday, the 12th, he informed the honorable Secretary of the Navy, by telegram, of the arrival of the Tigress at St. John's, and the landing of the party picked up by her, and asked for instructions concerning their disposal.

1873. May.

The Secretary of the Navy sent a telegram to Mr. Mulloy, in which he instructed him in regard to the funds for their care and relief.

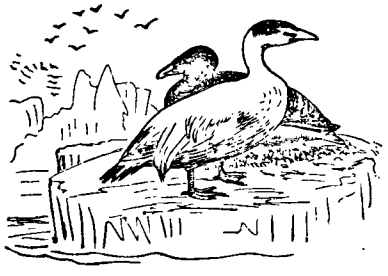
There being, at that time, no communication with St. John's, in consequence of the coast being blockaded by the ice and of the prevailing east winds, the Secretary dispatched, on the 15th of May, the United States steamer Frolic, Commander C. M. Schoonmaker, from New York, to bring home the rescued party. Commander Schoonmaker arrived at St. John's on the morning of the 22d. He had encountered icebergs, before reaching Cape Race, on the 21st, and on the following night passed more than one hundred of them, besides three ice-floes. He was unavoidably delayed at St. John's until the 27th, when he received the rescued party from the care of Consul Mulloy, and sailed on the same day for the United States, arriving at the Washington navy-yard on the 5th of June.

The Secretary of the Navy, in reporting to the President on the 17th of June the action of the Navy Department "in the matter of the disaster to the United States exploring expedition toward the north pole," says:—

"As it was obviously proper, in view of the prompt and responsible action which might be required, that the Government should, as soon as possible, be in possession of the fullest and most reliable information upon all the circumstances of the case, the Frolic was ordered to bring

1873. **May.** "directly to Washington all the persons having personal knowledge on the subject."

On the arrival of the Frolic, the Secretary instituted an examination of the party brought by her; the manner in which this examination was conducted, and its results, will be hereafter given.



XXIII

CHAPTER XXIII.

THE CRUISES OF THE UNITED STATES STEAMERS JUNIATA AND TIGRESS FOR THE RESCUE OF THE POLARIS AND HER CREW. 1873. May.

The information received from the floe-party concerning the condition and the situation of the Polaris when last seen by them, induced the Department to take prompt measures for the rescue of her officers and crew.

Anticipating this mode of action by the United States Government, the owners of the sealing-vessel Tigress immediately offered her to the United States for this special service, on terms which were accepted by the Department, under the sanction of the President. The ship was brought to the navy-yard, Brooklyn, where she underwent such changes and repairs as were necessary to qualify her for this duty, which embraced not only a distant cruise in high latitudes, but the possibility of wintering in the polar seas.

At the same time, the United States ship Juniata,

1873. June. third rate, "was made ready to proceed to the coast of Greenland, to facilitate the movements of the Tigress by carrying coal and other supplies, for which the latter had not sufficient capacity, and to prosecute the search herself, as far as was prudent for a vessel not built or strengthened for arctic navigation".

Commander D. L. Braine was selected for the command of the Juniata, and Commander James A. Greer for the Tigress. The Tigress was well fitted to encounter all the dangers of arctic navigation. The Juniata was not; and the commander of that vessel, therefore, was recommended to incur no more than ordinary risk and danger, but to aid in every way the object of the Tigress.

The Juniata sailed from New York on the 24th of June. Her officers were:—

Commander D. L. Braine, commanding;

Lieutenant-Commander E. C. Merriman;

Lieutenants G. W. De Long, G. E. Ide, E. P. McClellan, and C. W. Chipp;

Master F. E. Upton;

Ensigns W. F. Bulkley, S. P. Comly, S. H. May, J. D. Keeler;

Midshipman J. J. Hunker;

Surgeon T. C. Walton;

Assistant Surgeon B. F. Rogers,

Passed Assistant Paymaster T. S. Thompson;

Upernavik.

Chief Engineer H. B. Nones; **1873. July.**

Passed Assistant Engineer J. J. Barry;

Assistant Engineer H. E. Rhoades.

She entered the port of Sukkertoppen on the 17th of July, and anchored at Holstenborg on the 18th. Here Commander Braine, by the courtesy of Governor F. Lossen, procured eighteen dogs, and one hundred and fifty seal-skins for the clothing of the men and officers of the Tigress. He sailed on the next day for Disco, from which harbor he reported to the Secretary of the Navy, on the 29th, that he had landed there seventy tons of Cardiff coal, carefully bagged and stored; a quantity of lumber; and eighteen dogs: all of which, with twelve additional dogs procured there, were intended for the Tigress.

Commander Braine found the stores left by the Congress and the Polaris apparently in good order. The Juniata sailed, on the 29th, for Upernavik, arriving there on the 31st. Here the seal-skins were immediately landed, and made up into clothing for the officers and crew of the Tigress. This prompt action having been taken, Commander Braine proceeded to carry out the instructions of the Department by endeavoring to open communication with the Polaris by means of the Esquimaux.

After consultation with Governor Rudolph, he unfortunately found it impossible to induce the Esquimaux to go north for this object. Learning, however, that naviga-

1873. August. tion had been unusually open and free from floe-ice this year—in the language of the governor, "there had been no winter"—and finding that he could obtain a competent Esquimaux pilot, Commander Braine decided to send the large steam-launch of his own vessel to the north; a service for which she had been fitted by sheathing, and by arming her bows with iron and guarding her propeller with an iron frame. She was commanded by Lieut. G. W. De Long, who volunteered for this service, and she received the name of the "Little Juniata". The task assigned to her was to skirt the fast ice of the coast, collect all the information possible, and return by the 15th of August, which would be before the probable arrival of the Tigress at Upernavik. The officers and men were furnished with complete suits of fur clothing, and the launch was provisioned for sixty days, and supplied with coal for seventeen days' full steaming. She sailed from Tessi-Ussak August 3.

At Disco, Commander Braine learned that, early in June, the two English steam-whale-ships the Eric, Captain Walker, and the Arctic, Captain Adams, had touched there, and had been informed of the rescue of the floe-party and of the probable condition of the Polaris. The captains of these ships had kindly promised to keep a lookout for the latter on their northern passage. Commander Braine's conclusion was that they would examine

the western shore of Baffin's Bay, and if the Little Juniata now looked along the east coast, the Tigress might venture to proceed on the direct route to Northumberland Island. **1873.** **July.**

When the Tigress was entirely ready for sea, Commander Greer received instructions from the Secretary of the Navy, which directed him to proceed first to Saint John's, Newfoundland, to fill up with coal; and thence to Godhaven, Disco, where he could ascertain from the Danish authorities whether any information had been received from the Polaris or her crew, and where he would probably find letters from the Juniata, giving intelligence of her movements.

From Godhavn he was enjoined to proceed to Northumberland Island by the way of Upernavik and Tessi-Ussak, unless information received in the mean time, concerning the Polaris and her officers and crew, should render his further progress unnecessary. Commander Greer was also instructed to rescue and bring home, first, the officers and crew; secondly, the records, scientific and nautical; thirdly, the ship—named in the order of their importance. The Tigress was to winter in a high latitude, if necessary, and to resume the search in the ensuing summer. She was to carry Captain Tyson as

1873. July. ice-master and pilot, and Linquist, Kruger, and Nindemann, formerly seamen on the Polaris, with Esquimaux Joe as hunter and sledge-driver; Hans and his family were also to be taken on board, and landed at some port in Greenland.

The Secretary of the Navy visited the Tigress at the Brooklyn navy-yard, put her in commission, and made a short address to the officers and crew. The ship left New York on the afternoon of July 14.

Her officers were:—

Commander James A. Greer, commanding;

Lieutenant-Commander Henry C. White, executive officer;

Lieutenant George F. Wilkins, navigator;

Lieutenants Robert M. Berry and U. S. Sebree;

Acting Lieutenant George E. Tyson, ice-master;

Acting Master E. J. Chipman, assistant ice-master;

Engineers G. W. Melville and W. A. Mintzer;

Assistant Paymaster G. E. Baughman;

Acting Assistant Surgeon J. W. Elston.

The Tigress arrived at Saint John's on the morning of the 23d; at Godhavn, August 6; and Upernavik, where the Juniata was found, on the 10th. From this port she sailed on the 11th, having on board a Danish pilot, and anchored at Tessi-Ussak at 11.45 p. m. of the same day, Governor Jansen having boarded her outside

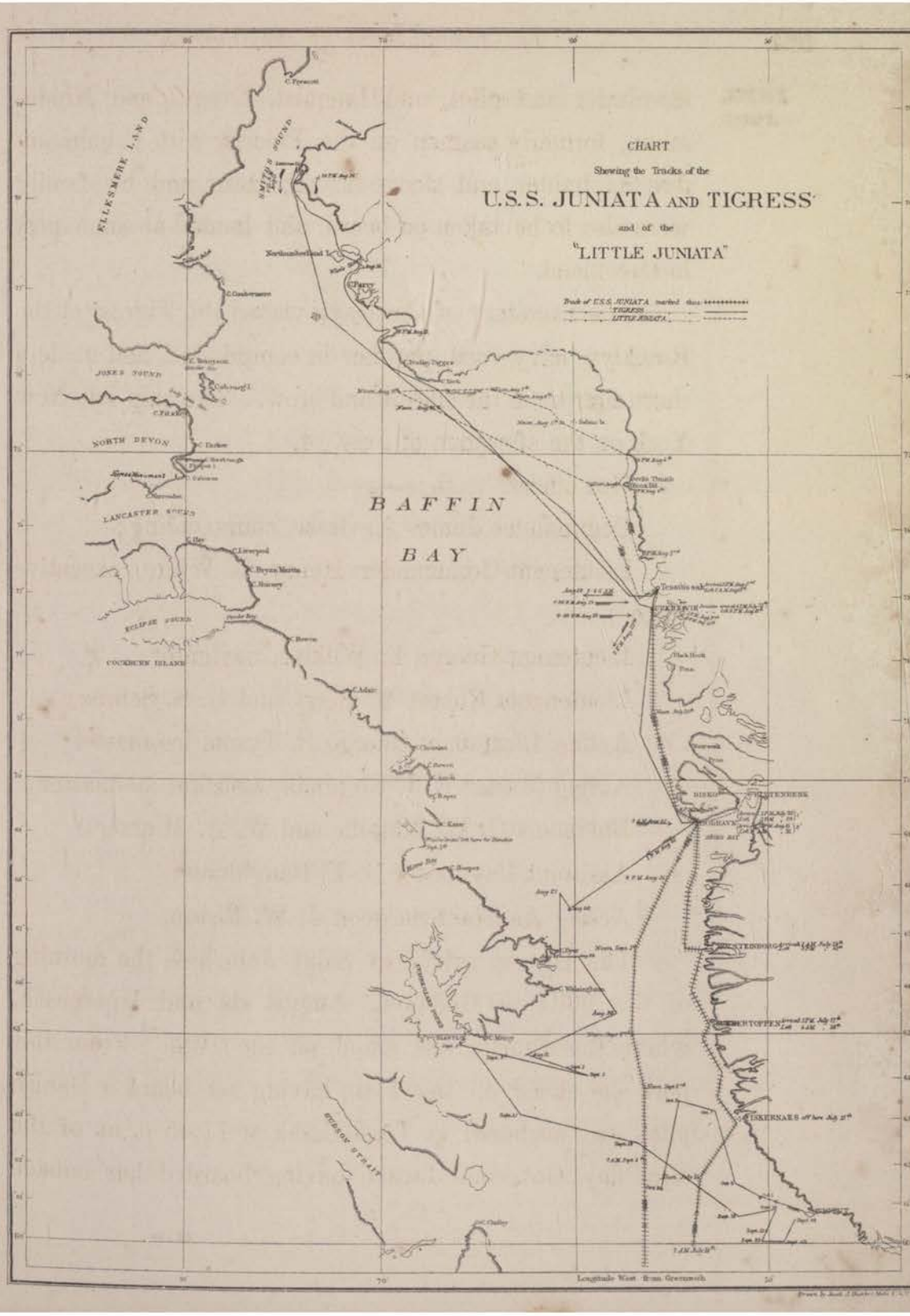


CHART
Showing the Tracks of the
U.S.S. JUNIATA AND TIGRESS
and of the
"LITTLE JUNIATA"
Track of U.S.S. JUNIATA marked thus
TIGRESS
LITTLE JUNIATA
ELLESMERE LAND
SMITH'S SOUND
Northumberland I.
C. Cumberland
JONES SOUND
NORTH DEVON
LANCASTER SOUND
BAFFIN
BAY
ECLIPSE SOUND
COCKBURN ISLAND
HUDSON STRAIT
Longitude West from Greenwich

and offered his services as pilot, which were accepted with pleasure. **1873. August.**

Having communicated with the Juniata's steam-launch, and learned that no information concerning the Polaris had been received, Commander Greer parted company with the launch and stood to the northward. At 10 a. m. of the 13th, he passed near enough to Cape York to see signals, for which a bright lookout was kept at all times. From Cape York north, he skirted the shores as closely as possible, examining also North Star Bay.

On the 14th, he examined Netilik Harbor. Skirting Northumberland Island, he satisfied himself that this was not the place where the separation of the Polaris from the ice-floe occurred, and continued on to Capes Parry and Alexander, and examined Hartstene Bay. At 9 p. m. of the same day, after passing Littleton and McGary Islands, Commander Greer was convinced that he had arrived at the place of which he was in search, and, standing well in to the shore, lowered a boat.

He had found the spot occupied by the crew of the Polaris the preceding winter. It was then in the possession of Esquimaux, from whom he learned the story of Captain Budington's party. The chief of the Esquimaux told Commander Greer that Captain Budington had given him the vessel; and that, some time after the departure of the crew, the ice had broken up in a gale, and the

1873. August. vessel was forced about a mile and a half toward the passage between Littleton Island and the mainland, where she sank. Commander Greer saw the broken hawsers. The chief said that he saw the ship go down, and very much regretted her loss; he took Lieutenant-Commander H. C. White to the spot, but it was then covered by two small ice-bergs with a heavy floe attached, which had grounded on the wreck.

The wooden house constructed by the crew of the Polaris was still standing, with its bunks, mattresses, furniture, galley, &c., as also was the rough carpenter's bench; while provisions, instruments, books, and stores of various kinds were scattered in every direction. All the manuscripts, including a mutilated log-book, and all the other books not torn into pieces, together with some fire-arms and broken instruments, the ship's bell, and some medical stores, were taken on board the Tigress. The provisions were of no value. No cairn, or place of concealment, for records or papers was found.

At this time, the weather was quite threatening—thick, squally, and snowing at times; an ice-pack extended across Smith's Sound northward as far as the eye could reach.

At 2.15 a. m. of the 15th, Commander Greer stood to the southward, keeping a lookout for the people; at noon of the next day, he passed Cape York near enough

to have seen signals. On the 19th, at 2.30 p. m., he communicated with Governor Jansen at Tessi-Ussak, but obtained no news; and at 9.30 p. m. he anchored at Upernavik, where also nothing had been heard of the Polaris. **1873. August.**

At Upernavik, he remained four days, and then sailed for Godhavn. He had come to the conclusion that the crew of the Polaris had been picked up by a whaler, and this opinion was confirmed when he learned that nine whalers had been spoken, all of which expected to sight Cape York.

In accordance with the instructions of the Department, "to make thorough search for the crew," Commander Greer, after refitting at Disco, crossed over to the west side of Davis Straits, and, falling in with the pack-ice, skirted it to the south and west, going into every lead which indicated a passage. He tried to get into Exeter Sound, but found the ice packed tight to the shore, and finally anchored at Niantlik in Cumberland Sound.

His object here was to fall in with some of the whaling-vessels which, on their return, follow the western shore. Meeting with none, he sailed, on the 16th of September, for Ivigtuk, Greenland, where he was detained for some days by necessary repairs to his machinery.

On the 4th of October, he made another run to the northward, without meeting the objects of his search; on

1873. August. the 17th, he reached Saint John's; and, on the 10th of November, anchored in New York.

The narrative now returns to the Juniata, Commander Braine, which was left, on the 11th of August, at Upernavik.

On the 12th, Commander Braine received the report of the cruise of the steam-launch Little Juniata, the departure of which has been already mentioned.

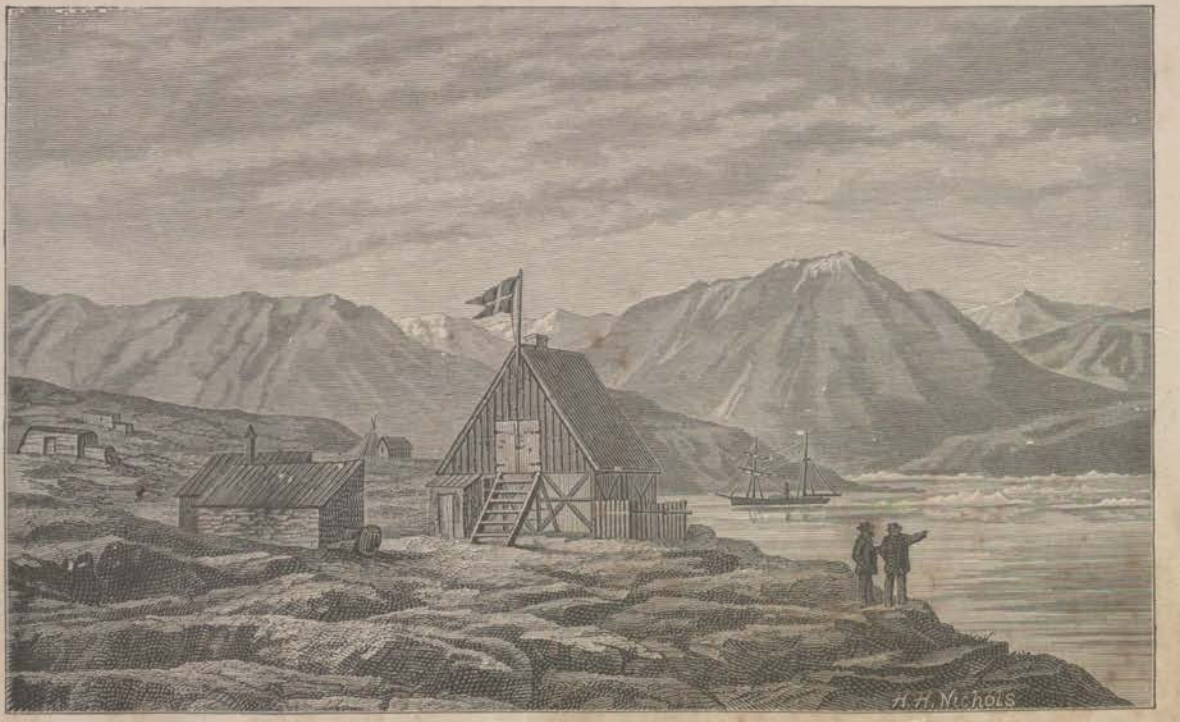
Her officers, all of whom were volunteers, were:—

Lieutenant G. W. De Long, commanding;
Lieutenant C. W. Chipp;
Ensign S. H. May;
Mr. Henry W. Dodge, ice-pilot.

Her crew were:—

Frank Hamilton, machinist;
Richard Street, boatswain's mate;
Martin T. Maher, } seamen.
William King, }

At 11 p. m., August 2, the Little Juniata arrived at Tessi-Ussak, where she left the dingy, from which 600 pounds of coal were landed, for future use. Next day, she steamed northward, winding her way among the icebergs, and keeping close in to the land, both for the sake of smooth water and of safe anchorage in the event of a fog.



Tessi-Ussak.

At 10 p. m. of the 4th, Lieutenant De Long found himself shut up in the pack, which, as far as could be seen, consisted of solid ice from one to two feet thick, with large hummocks and icebergs. The boat was kept under way with full steam-pressure, to prevent her being frozen in, and to get her to the westward into open water. The next morning, clear spaces of open water were met with, and a slight swell indicated an approach to the open sea, which was gained at 10 a. m. The launch was headed N. W. (true), for Cape York. **1873. August.**

While the fog prevailed, the fire was allowed to die out; but, inaction becoming tiresome, sail was made, and the launch stood to the north and west, with a slight S. E. wind; in the evening, the wind freshened.

On Friday, the 8th, Cape York was seen; but between it and the boat there was a solid pack of ice, three or four feet thick, in which an opening was looked for in vain. In the afternoon of the same day, the wind had increased to a gale, and made the situation of the launch on the edge of the pack one of great danger. It was necessary to carry sail, to keep the boat under control and clear of the pack. Lieutenant De Long says, in his report, that the sea-spray was thrown over the tops of icebergs one hundred feet in height. He describes the scene as one of great confusion; broken pieces at the edge were forced upon the solid part of the pack, and driven with

1873. **August.** violence to a great distance; and this was continuous. The launch was, at times, half-buried in the seas, and she shipped so much water that everything was deluged. It rained in torrents. This was one of those critical situations in which safety depends absolutely upon the mast, the canvas, and the rigging. As long as these hold on, the skill of the seaman can insure security from destruction; if they fail, all is lost; and yet, at such moments of extreme emergency, no additional means of strength can be applied, either to the mast or canvas. Providentially, everything held, and the boat was kept under control. In this condition, the launch remained until 10 o'clock of the 9th, during a period of thirty hours; finally the wind lulled. An attempt was made to light a fire under the boiler, but the matches and tinder were wet and useless, and it was several hours before a friction-match, kept near the skin, was sufficiently dried to be lighted. A candle in the lantern was lit, but immediately blown out; it was necessary to repeat the process. The wood being wet, a fire was started by pouring oil plentifully over cotton-waste and junk.

This was the turning-point of the Little Juniata's cruise. One-half of the fuel was expended, and what remained was damaged. Lieutenant De Long, having come up on the in-shore track, determined to return by the mid-channel, or off-shore track, in order to have another chance

of seeing something of the Polaris or of her people. The wind hauling to the westward, the storm-swell subsided, the weather cleared up, and the ice was soon lost to sight astern. **1873. August.**

The morning of Sunday, the 10th, was pleasant and promising. In the course of the day, the Devil's Thumb was seen at a distance of 60 miles. The weather, which was variable, became again cloudy and squally, with snow, hail, and rain. Monday was a pleasant day, and on Tuesday, the 12th, the launch having communicated with the Tigress off the harbor of Tessi-Ussak, went in, took on board the 600 pounds of coal, and rejoined the Juniata at Upernavik.

While Commander Braine was in Godhavn waiting the return of the Tigress, he employed his leisure time in looking for coal. He dispatched the Little Juniata to the mines on the Waigat, on the north side of the island, 90 miles from the anchorage, to inspect the coal, and obtain, if possible, a supply. The mines are a short distance from the beach, about 100 feet above the level of the sea, and the coal is easily obtained by the usual means. It is described by Commander Braine in the following words:—

"The coal proved frail in its structure, not bearing much handling, and was obtained in lumps. It was experimented with for fifteen hours' steaming in the Little Juniata, using salt-water. It ignites easily, burns freely,

1873. September "and forms very little clinker. The fine coal burns nearly as well as the lump. A regular pressure of steam was kept up, 20 pounds to the square inch, with the furnace-doors open part of the time, and at no time was the saturation above $\frac{2}{32}$. By weight, I judge it requires about one-fourth more of this coal to be consumed in any given time to produce a mechanical effect equal to the best Welsh coal. This coal is bituminous in its nature. It produces very little smoke, of a brownish color, and requires but little labor in stoking. The best results, as obtained, are from a thick and level fire.

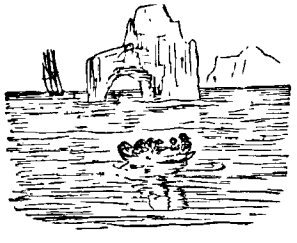
"While in this locality, several veins were found which indicated good coal, and large quantities of it; so easily was the coal mined that our men, nine in number, would have removed and carried to the beach one hundred tons in eight days with the tools which we used."

On the 31st of August, the Juniata sailed for Saint John's, arriving there September 10, from which port Commander Braine informed the Department by telegraph that Commander Greer had discovered the deserted camp of the Polaris near Littleton Island, and that her officers and crew were reported by the Esquimaux to have sailed south early in June, in two boats built from the Polaris.

A telegraphic reply of the same day directed him to continue the search for the Polaris. Commander Braine,

after filling up with coal, again left port on the 18th of September, and, at midnight of that date, when 65 miles north of Saint John's, was overtaken by the British steamer Hector, which vessel had been promptly and thoughtfully chartered, by Consul Mulloy, for this very purpose. Consul Mulloy had the pleasure of informing him of the safety of the officers and crew of the Polaris. This information had been telegraphed by Mr. Reid, United States Vice-Consul at Dundee. The Juniata immediately returned to Saint John's. On the 19th of October, in obedience to telegraphic orders, she left Saint John's for New York, where she arrived on the 25th.

1873.
October.



XXIV

CHAPTER XXIV.

EXAMINATION OF THE PARTY FROM THE POLARIS.

1873. June.

It has been already said that the part of the crew of the Polaris rescued from the ice-floe by the British sealer Tigress, and numbering nineteen persons, was brought from Saint John's to Washington by the United States steamer Frolic, under orders of the Secretary of the Navy, "for the purpose of obtaining the most full and reliable information" concerning their own history, the circumstances under which they left the Polaris, and the condition of that vessel.

On their arrival, June 5, 1873, Hon. G. M. Robeson, Secretary of the Navy, associated with himself Commodore William Reynolds, the senior officer of the Navy Department; Prof. S. F. Baird, assistant secretary of the Smithsonian Institution and member of the National Academy; and Capt. H. W. Howgate, of the Army Signal Service, to constitute a Board of Inquiry.

1873. June. The result of this examination is contained in the following report to the President:—

"WASHINGTON, D. C., *June* 16, 1873.

"*To the President:*

"The undersigned having been present at and taken part in the full and careful examination of Mr. George E. Tyson, assistant navigator; Frederick Meyer, meteorologist; J. W. C. Krüger, G. W. Linquist, Frederick Aunting, Peter Johnson, Frederick Jamka, and William Nindemann, seamen; John Herron, steward; William Jackson, cook; and Joe, Hannah, and Hans, Esquimaux;—all late of the steamer Polaris, and, with the exception of the wife of Hans and five children, comprising the party which was separated from her on the ice in October last, and picked up off the coast of Labrador on April 30th of this year by the British sealing-steamer Tigress;—give the following as the result of their investigation.

"The Polaris left Disco on the 17th of August, 1871, where she parted company with the Congress, arriving at Upernavik the next day.

"At this port she took on board some dogs, seal and dog skins, and a small quantity of coal, and shipped Hans Hendrick (or Christian), Esquimaux who had been with Drs. Kane and Hayes, and the wife of Hans and three children. It was expected that Jensen, who had also

"accompanied Dr. Hayes, would join the Polaris at Tessi-Ussak. 1873. June.

"Leaving Upernavik, the Polaris touched at Tessi-Ussak, and there procured more dogs and a small quantity of ready-made skin clothing; but Jensen did not go with the Expedition.

"Leaving Tessi-Ussak on the 24th, she proceeded northward under steam, passing through Smith's Sound and Kennedy Channel, with very little delay or obstruction from the ice.

"Near Cape Frazer, Captain Hall examined the western shore in a boat to look for a safe wintering place, but was unsuccessful in finding one.

"Clearing Kennedy Channel in the Polaris, Captain Hall found himself passing through a large sound in the precise position of Kane's open polar sea, with a bay on the Greenland side. In this bay, the ship subsequently wintered, and it received from Captain Hall the name of Polaris Bay. Its northern cape he called Cape Lupton.

"Pressing on to the northward, and passing through the sound, the ship entered another narrow channel, of about twenty-five to thirty miles in width, with high land on either side, and, on the 30th of August, attained the highest northern latitude reached by the Expedition, in latitude declared by Captain Hall to be 82° 29′ N., but

1873. June. "afterward found, by the careful calculation of Mr. Meyer, to be 82° 16′ N.

"At this, her highest point, the Polaris was still in the new strait, or channel which she had discovered, and which Captain Hall named 'Robeson Strait', after the present Secretary of the Navy.

"Here the ship was met by heavy floating ice, extending entirely across the Strait, and barring her further progress northward.

"After making unsuccessful efforts to find a way through the ice, Captain Hall, in a boat, examined a small harbor on the eastern side of the straits, for winter-quarters. This being found unsuitable for the purpose, was named 'Repulse Harbor'. After incurring imminent risk, the ship became fairly beset in these straits, and drifted with the ice to the southward, out of them, to the latitude of 81° 30′ N.; when, the pack opening, on the 4th of September she steamed to the eastward, and found her winter-quarters in a small sheltered cove, or bend of the coast, protected by a stranded iceberg on the east side of Polaris Bay, in latitude 81° 38′ N., longitude 61° 44′ W. To this cove Captain Hall gave the name of 'Thank-God Harbor', calling the iceberg 'Providence Berg'.

"At midnight on the 4th of September, 1871, Captain Hall landed, with a boat, on the east shore of Polaris Bay, and, in the name of God and of the President of the United

"States, raised the American flag on the land he had discovered. 1873. June.

"On one occasion, while beset in Robeson Strait, the Polaris seemed to be in such danger of being crushed, that provisions were placed upon the ice, and measures taken to be in readiness for leaving her; but she happily escaped without injury.

"Immediately after securing his ship in winter-quarters, Captain Hall made preparations for a sledge-journey northward; and other work was commenced by landing and setting up the observatory, getting the scientific observations under way, surveying the harbor, clearing up the ship, and making snug for the winter.

"On the 10th of October, Captain Hall left the Polaris, accompanied by Mr. Chester, first mate, and Esquimaux Joe and Hans, with two sledges and fourteen dogs. Setting out on this expedition, the first step taken by Captain Hall fell upon land more northern than white man's foot had ever before touched. In the progress of the journey—unhappily the last that Captain Hall was to make toward the Pole—he discovered, as appears by his dispatch, a river, a lake, and a large inlet. The latter, in latitude 81° 57′ N., he named 'Newman's Bay', calling its northern point 'Cape Brevoort', and the southern one 'Sumner Headland'.

"At Cape Brevoort, in latitude 82° 2′ N., longitude

1873. June. "61° 20′ W., he rested, making there his sixth snow-encampment, and on October 20th wrote his last dispatch to the Secretary of the Navy, the original draft of which was found, in his own handwriting, in his writing-desk, on its examination in Washington after it was delivered to the Secretary of the Navy by Esquimaux Joe, who had kept the desk in his custody from the time it was picked up on the ice, after the separation of the rescued party from the ship.

"A copy of this dispatch, so singularly preserved, accompanies this report.* Captain Hall himself deposited a transcript of it in a cairn on the side of the mountain at Cape Brevoort.

"Captain Hall, it appears, had hoped, when he left the Polaris on this journey, to advance northward at least a hundred miles; but, after having gone about fifty, he was compelled, by the condition of the shore and of the ice, and by the state of the climate, to return and await the approach of spring for another attempt.

"He reached the ship on the 24th of October, apparently in his usual fine health, but was attacked the same day with sickness of the stomach and vomiting; and, taking to his bed, the next day was found to be seriously ill. His most marked symptoms seemed from the evidence to have been such as indicated congestion of the brain, ac-

* See page 163 of this Narrative.

"companied by delirium and partial paralysis of one side. The witnesses all state that his attack was called 'apoplexy', and some of them speak of their own knowledge of his paralysis and delirium. He recovered, however, after some days, sufficiently to leave his bed, to move about his cabin a little, and to attempt to attend to business, but soon had a relapse, became again delirious, and died on the 8th of November, 1871. Three days afterward he was buried on the shore. 1873. June.

"From personal examination of all the witnesses, and from their testimony as given, we reach the unanimous conclusion that the death of Captain Hall resulted naturally from disease, without fault on the part of any one. During his illness, he was under the medical care of Dr. Bessels; and as none of the persons now here are capable of giving a more particular account of the nature and symptoms of this fatal sickness, the return of the Polaris must be awaited for precise information. All the persons examined testify to the uniform kindness and care of Captain Hall, and to the good order and efficient condition of the Polaris while under his command.

"On the death of Captain Hall, Mr. Budington succeeded to the command of the Polaris, as had been provided for in the Instructions for the voyage issued by the Secretary of the Navy.

"The winter was passed as is usual in the Arctic

1873. June. "regions, but without any suffering from the cold, from disease, or from the want of proper provisions. The scientific observations were diligently kept up. Polaris and Newman's Bays were surveyed, and the coast-line to the southward of Polaris Bay was examined for over seventy miles. The crew were variously employed, and the Esquimaux hunted whenever opportunity permitted.

"About the latter part of November, in a heavy gale from the northeast, the Polaris dragged her anchors, but brought up against the large iceberg before mentioned, which was aground in the bay. She was finally made fast to it, and so remained till the following summer.

"During the winter, she was forced by the pressure of other ice sweeping down against her, upon the foot of Providence Berg; and being subsequently carried higher upon it by the rising of the tide and renewed pressure from the ice, she thus remained until June, 1872. Her stem-piece, resting uneasily during the whole of the stormy winter on this ice-bed, was cracked, and some of her bow-planks split, causing her to leak after she again got afloat. She seems to have leaked somewhat freely at first, and the steam-pumps were worked to clear her out; but subsequently the deck-pumps, used about six minutes per hour, were found sufficient to keep her clear.

"Early in June, before the Polaris was released from the ice, Captain Budington dispatched Mr. Chester and

"Mr. Tyson, with two boats, to endeavor to get as far north as practicable. This party lost one boat, which was crushed in the ice, almost at the commencement of their journey; the loss was, however, supplied from the Polaris by the canvas boat, and, with much difficulty and delay, they got as far north as Newman's Bay. They there waited the possible opening of the ice until the middle of July, when written orders from Captain Budington directed their return to the ship. They were unable to transport the boats, and, leaving them on the shore, started on foot, and arrived on board after an absence of about six weeks. 1873. June.

"While they were away, and some time in June, the Polaris had broken out of her winter-quarters, and had made several attempts to proceed northward to pick up the party with the boats; but the ice was found to be impassable, and Captain Budington, on receiving the party on board, determined to make the best of his way southward to the United States as soon as the ice would permit. They started southward August 12th, 1872, and slowly made their way along the western shore until the next day, when the ship, having got further in mid-channel, was badly beset by the ice in latitude about 80° 40′ N., and was in danger of wreck for some hours, when she was freed again.

"Early on the morning of the 12th, the day of starting southward, the family of Hans Christian was increased

1873. June. "by the birth of a son, who was christened Charles Polaris, and who made one of the party afterward left on the ice-floe.

"On the 16th of August, the ship was made fast to a large floe of ice in the latitude of 80° 2′ N., and longitude about 68° W., and while still fast to this floe drifted south through Smith's Sound nearly to Northumberland Island.

"In pursuance of the usual orders under similar circumstances, a quantity of provisions and some fuel had been placed on the deck of the steamer, in readiness to be removed to the ice should the safety of the ship become endangered; and it was ordered and understood that, if a crisis should be imminent, not only these stores, but clothing, papers, records, instruments, guns, ammunition, &c., were also to be put upon the floe, in order to preserve the lives of the party and the results of the expedition, should it become necessary to abandon the ship and to take refuge on the ice. A canvas hut had also been erected upon the floe for shelter should the ship be lost.

"On the night of the 15th of October, 1872, in about latitude 77° 35′ N., during a violent gale of wind and snow, the need for such preparations became apparent, as the ship was suddenly beset by a tremendous pressure of ice, which was driven against her from the southward, and forced under her, pressing her up out of the water, and,

An Arctic Moonlight Scene.

"by successive and violent shocks, finally throwing her over on her beam-ends. 1873. June.

"Captain Budington directed the provisions, stores, and materials in readiness, as before described, to be thrown overboard on the ice, and ordered half the crew upon the ice to carry them upon a thicker part of the hummocks, where they would be comparatively safe. He also sent all the Esquimaux, with their kyaks, out of the ship, and lowered the two remaining boats upon the floe. While so engaged, in the darkness of an Arctic night, in the midst of a fierce gale and driving snow-storm, the hawsers of the Polaris failed to hold her, and she broke adrift from the floe, and in a few minutes was out of sight of the party who were at that moment busily at work on the ice. It is the uniform opinion of the witnesses, and our unanimous conclusion from their testimony and from the circumstances detailed, that this separation of the ship from the men, women, and children upon the ice-floe, was purely accidental.

"After losing sight of the ship, some of the men and a large part of the provisions were found to be afloat on a separate piece of ice. The men were rescued by means of the boats, which, fortunately, had been saved on the ice, and the party thus collected on the main floe passed the night as well as they could. The next day they made several attempts to reach the land with the boats, but

1873. June. "failed, notwithstanding their most persistent efforts, owing to the obstruction of the ice and the violence of the wind. While thus striving to get on shore, but at what particular time of the day is not exactly ascertained, the Polaris came in sight to the northward, apparently coming toward the floe, under steam and sails. An India-rubber blanket was hoisted on an oar, and displayed from the top of a hummock; the colors were set, and other signals were made to attract the attention of the Polaris; and as she approached so near to them that they plainly saw her down to her rail, and could distinguish her escape-pipe, and kept on toward them until they supposed her to be not more than four miles off, they felt sure she could force her way through the ice to their position; and that in a little while they would be again on board. In this they were disappointed; the Polaris altered her course and disappeared behind the shore. Some time afterward, as the floe drifted away, she was again seen by some of the men under the land, with her sails furled, and apparently at anchor, or made fast to the shore or the ice.

"It is most likely that the party on the ice was seen from the Polaris. The hut erected on the floe, the ship's boats, the colors, the elevated signal-blanket, and the group of nineteen persons standing in relief against a white background, could scarcely have remained unnoticed.

"It was natural that, under the circumstances, the

"party on the ice should have felt deeply disappointed at the failure of the ship to come to their relief, and should, at the time, have ascribed it to overcaution, if not indifference, rather than inability on the part of her responsible commander; neither is it unnatural that this feeling, fostered during the weary watches of their long winter upon the ice, should still remain to affect in a greater or less degree their present judgment on the subject; but it must not be forgotten that they, like ourselves, were and are without full information of the actual condition of the Polaris at the time spoken of, and cannot know how far the real dangers of their position were understood and appreciated by those on board of her. Such information and knowledge are absolutely necessary to a correct judgment, and must not be assumed as the foundation of censure against persons acting under circumstances so trying and uncertain, who, by reason of their enforced absence, have no opportunity for explanation. Considering the subject dispassionately, and remembering the Polaris had been so roughly handled by the ice the night before, that both captain and crew thought she would be lost, and attempted the removal of her provisions and materials to the floe; that when she broke adrift and was swept off by the gale, her steam-pipes, valves, and connections were frozen solid, and that she was for hours without steam, unmanageable amid the floating ice; that she was still leaking from her broken

1873. June.

1873. June. "stem, and had probably received other injuries after she went adrift; and that she was left without a single boat of any kind, it seems most likely that her actual condition was such as to impose upon her commander the duty of getting her, with the lives and property which remained under his charge, at once into a position of safety under the shelter of Northumberland Island,* where she was last seen by the party on the floe. If such were the state of the case, the first duty of Captain Budington under such circumstances was to look to his vessel, particularly as he probably believed that the party on the ice could, by the aid of the two boats, the kyaks, and the scow in their possession, find their way back to the Polaris quite as easily as he could force his way to them.

"But whatever might have been his opinion or theirs, the elements quickly determined the question. Shortly after the Polaris had been sighted for the second time, a violent gale from the northeast sprung up, the weather became thick, the ship and the land were lost sight of, and the ice-floe drifted away to the southward, with these nineteen persons still upon it. In view of the circumstances detailed, it is therefore our unanimous judgment that this final separation from the ship was also accidental.

"From October 15th, 1872, until April 30th, 1873, when they were picked up in latitude about 59°† north, these

* Subsequently ascertained to have been Littleton Island.

† Subsequently ascertained to have been 53° 30′ N.

"nineteen men, women, and children remained through the whole of the dark and dreary winter upon the ice. In their first endeavors to reach the land, they occupied for a time different pieces of floating ice, but forced finally to abandon all hope in this direction, they rested at last upon the floe upon which the Polaris had made fast August 15th, 1872, in latitude 80° 2′ N., and from which she broke adrift on the night of October 15th, following. 1873. June.

"The original extent of this floe they estimated at about five miles in circumference. Snow-huts were built by the Esquimaux, in which they lived and kept their provisions. Of these they had saved a fair supply, which they apportioned and divided by means of weights made from shot, with rude scales devised by Mr. Meyer. Occasionally during the winter the Esquimaux shot a seal, and once they killed a bear, and thus renewed their supply of meat.

"On the 1st of April, finding their icy quarters much reduced by the breaking-up of the floe, and that the current was then setting them to the southeast and out to sea, they launched their boat into open water, and pulled toward the west, in order, if possible, to gain the coast. At times, meeting ice too closely packed to get through, they were compelled to haul the boat upon it, launching her again as soon as a lead opened to the westward or southward. In this way they passed a month of weary and desperate endeavor.

1873. June. "Toward the close of April, their provisions were almost exhausted, and they were one day absolutely reduced to less than a biscuit apiece and a mouthful of pemmican, when a bear, scenting them on the ice, approached them and was shot, and they were thus rescued from starvation.

"Revived by this good fortune, and strengthened by their new supply of fresh meat, they struggled on till the last day of April, 1873, when they were rescued by the Tigress. At this time, they had the coast of Labrador in sight, distant about forty miles, and were hoping to reach it before their provisions were exhausted.

"The circumstances of this most extraordinary voyage are given at length by the witnesses, and are particularly detailed in the diaries that some of the rescued party made, day by day, upon the ice, and which are copied in the testimony.

"After their rescue, although enfeebled by scanty diet and long exposure, and mentally depressed by their isolated and unhappy situation, so fearfully prolonged and of such uncertain issue, the general health of these hardy voyagers remained good, and, when their trials and anxieties were ended, they soon regained their usual strength.

"At the time of their separation from the Polaris, every one belonging to the expedition was in good health. Nineteen were upon the ice-floe, and they believed that all the rest were safe and on board the ship. The Polaris

"had not then repaired her broken stem, and still leaked somewhat, but was easily freed by the deck-pumps. She had plenty of provisions, but not much coal—probably about enough to last through the winter. She was last seen, apparently at anchor, under Northumberland Island,* where it is most likely she remained for winter-quarters. Dr. Hayes found Esquimaux residing on that island, and the Esquimaux settlement at Netlik is close by. Communication with these people would be easily opened and maintained, and no apprehension for the Polaris, or, in the absence of accident or sickness, for those on board, is entertained by any of the rescued persons. 1873. June.

"As to the question whether the ship can make her way to the Danish settlements at Upernavik or Disco, without steam, if she gets free from the ice this season, supposing her to be in as good condition as when the rescued party was last on board, the witnesses differ in judgment; but the safer, if not the better opinion is that she will need assistance to bring her completely and safely out. Northumberland Island is in latitude 77° 35′ N. A well-found ship, with average good fortune, would be able to reach that island in the summer, and to return in the autumn. It is possible that the Polaris may be able to return without assistance; but, as she remains within the

* Subsequently shown to have been Littleton Island—see page 585 of this Narrative.

1873. June. "Arctic circle, not sound in her hull, with little fuel, and with many precious lives on board, and with the records and collections of her cruise in their possession, we are unanimously of the opinion that this possibility should not be assumed, and that a suitable vessel should, as soon as possible, be procured and sent in search of her, to render her return as certain and speedy as may be. While a suitable ship, constructed and fitted for voyages among the ice, is getting ready, we believe it would be well to dispatch such naval vessel as may be available, to carry forward proper supplies of coal and provisions for the relief of the Expedition, to inform the authorities of Greenland of the condition of affairs, to gather all possible information from them and from the Esquimaux of the coast, and, if possible, by means of the latter, to send some intimations of speedy relief to the officers and crew of the ice-bound ship.

"From the testimony, it appears that every possible opportunity was embraced by the members of the scientific corps of the expedition to carry out the instructions given; the only direction in which there seems to have been a partial failure being in reference to the use of the photographic apparatus and the dredge. This, however, was due to the absence of suitable opportunities, or to some insurmountable impediment at the time. While the records of the astronomical, meteorological, magnetic, tidal, and other physical departments of the exploration

"appear to have been extremely full, and the observations in each appear to have been conducted according to approved methods, the collections of natural history are shown to have been not less extensive, the store-rooms of the Polaris being filled with skins and skeletons of musk-oxen, bears, and other mammals; different specimens of birds and their eggs; numerous marine invertebrata; plants, both recent and fossil; minerals, &c. Not the least interesting of these collections are specimens of driftwood picked up on or near the shores of Newman's and Polaris Bays, among which Mr. Meyer thought he recognized distinctly the walnut, the ash, and the pine. Among the numerous facts that appear to be shown by the testimony elicited on the examination, we may mention, as one of much interest, that the deviation of the needle amounted to 96°, being less than at Port Foulke and Rensselaer Harbor, as given by Dr. Kane and Dr. Hayes. Auroras were frequent, but by no means brilliant; generally quite light, and consisting sometimes of one arch, and sometimes of several. Streamers were quite rare. Only in one instance (in February, 1872) did the aurora appear of a distinct rosy red. This was foreboded in the morning, from 8 to 10 o'clock, by a very decided disturbance of the magnetic needle. Shooting-stars were so constantly seen that, although no special shower was observed, it was scarcely possible ever to look at the star-lit sky without noticing

1873. June.

1873. June. "them in one direction or another. The rise and fall of the tides were carefully observed, the average being about five and a half feet. The greatest depth of water noticed was about one hundred fathoms. The existence of a constant current southward was noted by the expedition, its rapidity varying with the season and locality. The winter temperature was found to be much milder than was expected, the minimum being 48° below zero in January, although March proved to be the coldest month.

"The prevailing winds were from the northeast, although there were occasionally violent tempests from the southwest. Light winds were noticed, however, from all points of the compass. Rain was occasionally observed—only on the land, however—the precipitation presenting itself over the ice in the form of snow. During the summer, the entire extent of lowlands and elevations remains bare of both snow and ice, excepting patches here and there in the shade of the rocks. The soil, during this period, was covered with a more or less dense vegetation of moss, with which several Arctic plants were interspersed—some of them of considerable beauty, though entirely without scent—and many small willows, scarcely reaching the dignity of shrubs. The rocks noticed were of a schistose or slaty nature, and, in some instances, contained fossil plants, specimens of which were collected. Distinct evidence of former glaciers were seen in localities

"now bare of ice, these indications consisting in the occurrence of terminal and lateral moraines. 1873. June.

"Animal life was found to abound, musk-oxen being shot at intervals throughout the winter, their food consisting of the moss and other vegetation obtained during this season by scraping off the snow with their hoofs. Wolves, also bears, foxes, lemmings, and other mammals, were repeatedly observed. Geese, ducks, and other water-fowls, including plover and other wading-birds, abounded during the summer, although the species of land-birds were comparatively few, including, however, as might have been expected, large numbers of ptarmigans, or snow-partridges No mention is made by the rescued party of the occurrence of hawks and owls. No fish were seen, although the net and line were frequently called into play in the attempt to obtain them. The waters, however, were found filled, to an extraordinary degree, with marine invertebrata, including jelly-fish and shrimps. It was believed by the party that the seals depend upon the latter for their principal subsistence, the seals themselves being very abundant. Numerous insects were observed, especially several species of butterflies, specimens of which were collected; also, flies and bees, and insects of like character.

"The geographical results of the expedition, so far as they can now be ascertained from the testimony of Messrs.

1873. June. "Tyson, Meyer, and their comrades, may be summed up briefly as follows:

"The open polar sea laid down by Kane and Hayes is found to be in reality a sound of considerable extent, formed by the somewhat abrupt expansion of Kennedy's Channel to the northward, and broken by Lady Franklin's Bay on the west, and on the east by a large inlet, or fiord, twenty-two miles wide at the opening, and certainly extending far inland to the southeast. Its length was not ascertained, and Mr. Meyer thinks that it may be, in fact, a strait extending till it communicates with the Francis Joseph Sound of the Germania and Hansa expedition, and with it defining the northern limits of Greenland. This inlet was called the Southern Fiord. North of it, on the same side, is the indentation of the shore called Polaris Bay by Captain Hall, where the Polaris wintered in latitude 81° 38′ north. The northern point of this bay was named Cape Lupton. Its southern point is yet without a name.

"From Cape Lupton, the land trends to the northeast, and forms the eastern shore of a new channel from twenty-five to thirty miles wide, opening out of the sound above mentioned, to which Captain Hall, as has already been stated, gave the name of Robeson Strait. The western shore of these straits, north of Grinnell Land, is also nameless. Northeast of Cape Lupton, in latitude 81° 57′,

"is a deep inlet, which Captain Hall called Newman's Bay, naming its northern point Cape Brevoort, and its southern bluff Sumner Headland. From Cape Brevoort, the northeast trend of the land continues to Repulse Harbor, in latitude 82° 9′ N.—the highest northern position reached by land during this expedition. 1873. June.

"From an elevation of 1,700 feet at Repulse Harbor, on the east coast of Robeson Strait, the land continues northeast to the end of those straits, and thence east and southeast till lost in the distance, its vanishing point bearing south of east from the place of observation.

"No other land was visible to the northeast, but land was seen on the west coast, extending northward as far as the eye could reach, and apparently terminating in a headland and near latitude 84° N.

"Mr. Meyer also states that directly to the north he observed, on a bright day, from the elevation mentioned, a line of light apparently circular in form, which was thought by other observers to be land, but which he supposed to indicate open water.

"Besides ascertaining accurately the condition and extent of what was before supposed to be an open polar sea; discovering the southern fiord to the southeast, and Robeson Strait to the north, with another wide expanse of water beyond it; extending, by examination and survey, the coast-line on the east up to latitude 82° 9′ N.,

1873. June. "and by observation somewhat farther; prolonging the west coast to the northward: reaching with the Polaris, under steam, the high latitude of 82° 16′ N.—a point far beyond the limits of all previous navigation toward the pole; errors in the shore-line of the west coast as laid down by Dr. Hayes, and also errors in the shore-line of Greenland as laid down by Dr. Kane, were observed and corrected.

"Of course, the full scientific results of the Polaris expedition cannot be known until that vessel shall have been found and brought back with the treasures she has gathered, and the records and details of her Arctic Explorations. But enough is told by the witnesses whom we have examined to excite expectation and encourage the hope of large and valuable additions to the domain of human knowledge.

"GEO. M. ROBESON,

"*Secretary of the Navy.*

"SPENCER F. BAIRD,

"*Assistant Secretary of the Smithsonian Institution.*

"WM. REYNOLDS,

"*Commodore, United States Navy.*

"H. W. HOWGATE,

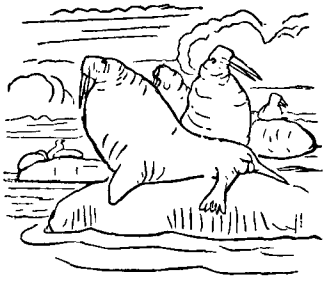
"*Acting Signal-Officer, United States Army.*"

On the 11th of October, 1873, Captain S. O. Budington; the First Mate, Chester; Second Mate, Morton; Dr.

Bessels; First Engineer, Schumann; Second Engineer, Odell; Carpenter, Coffin; Fireman, Campbell; and Seamen, Siemens, Hobby, and Hayes underwent an examination similar to the previous one of June 5th, 1873: and, finally, on the 24th of December, Mr. R. W. D. Bryan, astronomer of the expedition; J. B. Mauch, captain's clerk; and J. W. Booth, machinist of the Polaris, were examined in like manner. **1873. June.**

The information acquired on these subsequent examinations did not, in any manner, qualify or change the report of the Secretary, of June 16th.*

*All of these examinations will be found in full in the Report of the Secretary of the Navy for the year 1873.



XXV

CHAPTER XXV.

THE AWARD OF THE GOLD MEDAL.*

In closing this narrative of an expedition due entirely to the genius and perseverance of Hall, it is very grateful to be able to show that his character and services, and the results of his expedition, have received distinguished recognition abroad.

At the general session, April 21, 1875, of the Geographical Society of Paris—the oldest of geographical societies—the following report was presented by M. V. A. Malte Brun.

*An electrotype of this medal, with electrotypes of those awarded by the Geographical Society of Paris to Kane and Hayes, struck at the mint of France, formed a part of the Arctic collection placed by the Naval Observatory in the Government Building at the International Exhibition of 1876.

"*Report on the competition for the annual prize, made to the Geographical Society of Paris, in the name of a commission consisting of MM. Delesse, V. de St.-Martin, E. Cortambert, C. Maunoir, G. Duveyrier; and V. A. Malte Brun, vice-president of the central commission, reporting.*

* * * * * * *

"We had this year to award the biennial prize devoted to arctic explorations, which M. Alexandre de la Roquette instituted in honor of his lamented father, one of our founders, who, for forty-six years, was so devoted to its interests.

"The Prize Commission has before it several enterprises, which have had for their object either Smith's Sound, Eastern Greenland, Spitzbergen, or Nova Zembla. All of these deserve the tribute of our praise; but, especially that of the Polaris, the ship in which the American, Francis Hall, passed beyond Smith's Sound and Kennedy Channel, as far as 82° 16′—that is to say, the nearest to the pole that any vessel has reached *under sail*—has particularly commanded the unanimous vote of the Commission.

"Besides, Captain Hall was a veteran in arctic expeditions. In the year 1850, while carrying on the business of an engraver at Cincinnati, Ohio, he was seized with the desire to take part in the expeditions sent out in search of

"Franklin, which were then so popular. Laying aside his graving-tools, he devoted all his leisure hours to the study of the polar regions of America. At first, he designed to take part in the memorable expedition of McClintock, in a vessel equipped by himself; but he was too late for this. On the return of the English navigator, he still thought that the whole story of the fate of the seamen of Franklin's expedition had not been told; and, to solve the mystery, he resolved to organize a new expedition, and succeeded in interesting in his enterprise several distinguished gentlemen, among whom was Mr. Henry Grinnell, the well-known philanthropist; he left New London, in 1860, in the whale-ship George Henry.

"The loss of his own boat prevented him from completing the proposed journey westward; but he found very interesting traces of Frobisher's expedition, which, three centuries before, visited that region by order of Queen Elizabeth; and he satisfied himself, among other geographical determinations, that what on our charts had been marked as Frobisher's Straits is a long, open bay, without any communication with the inland sea, or bay of Hudson.

"On his return to the United States, in 1862, he published the results of his researches, in a work which met with great success—his 'Life with the Esquimaux'; but, being seized with a kind of homesickness for a country which otherwise could have no attractions for one accus-

"tomed to the comforts of city life, in 1864, he returned to the polar regions with his faithful companions, the two Esquimaux Joe and Hannah. For five successive years, he explored the northern shores of Hudson's Bay, living among the Esquimaux, and sharing their raw meat and seal-oil. He made himself thoroughly acquainted with their language, customs, and traditions, and was thus admirably prepared, on his return to his country in 1869, for his great expedition to the pole—the final object of all his efforts.

"He busied himself very promptly in organizing it, and, although friends would have turned him aside from this perilous enterprise, he appealed to Congress to obtain the assistance of the American Government, and, while awaiting its action, sustained himself and his Esquimaux friends by lectures upon his preceding voyages.

"The action of Congress was delayed by political causes; he met with more than one disappointment in the course of his appeals. He tells us that, at this time, he took new courage in the careful study of the life of Columbus, the example of the illustrious navigator more than once strengthening his persevering resolution.

"Finally, he obtained the use of a vessel which had been laid up since the war of the secession, a tug of 400 tons, which he managed to have fitted up suitably for the rough navigation in the ice; he christened her by the significant name, *Polaris*.

"I will not go over with you the fearful trials of the perilous voyage, or speak of the extreme point which the Polaris reached; of the death of Hall; of his second in command; of the drifting away of one part of the crew on the floe, while the other part were forced to abandon the ship, and only reached their country at the cost of a thousand dangers. Our secretary-general has given an account of these sad details to you in the annual reports, which we all so justly appreciate.

"I will but run over the scientific results of the expedition, which are considerable. More than 700 miles of coast-line have been discovered and reconnoitered It is now proved that Kennedy Channel extends beyond Cape Constitution—the highest point reached by Kane in 1854. On the right, another strait, Robeson Channel, opens, having a very perceptible current from east to west. From the summit of an elevation near where the party wintered, the land was seen extending north to the 84th degree. The temperature was sensibly less severe than it was at a point several degrees further south; and animal life showed itself by the presence of numerous herds of the musk-ox, with many hares and other animals.

"Dr. Bessels, the chief of the scientific corps to which the largest part of these acquisitions is to be credited, at the beginning of his winter residence, 1871–72, established, in the bay named from the ship, an observa-

"tory on an elevation 12 metres above the level of the sea. He then made a number of astronomical observations to determine its position, besides magnetic, meteorological, geological, botanical, and zoological investigations. He also observed with the pendulum for gravity.

"The flora and fauna of Hall Land—the name given to the prolongation of Grinnell Land and Washington Land toward the north—are quite rich. Eight species of mammals, twenty-three of birds, fifteen of insects, and seventeen of plants were found. The enumeration of these will be found in the letter addressed by Dr. Bessels to our secretary-general, dated July 19, 1874, and published in the society's bulletin of March, 1875.

"In consideration of these results, your Prize Commission has judged it their duty to award to Francis Hall, the promoter and chief of the Polaris expedition, that which is otherwise due him for his previous labors, the Gold Medal of the Roquette Foundation.

"But Francis Hall, like his fellow-countryman, Kane seventeen years before him, has fallen a victim to his sufferings, and it is on a tomb that we must once more deposit a crown. If we are denied the gratification of giving to Francis Hall the medal which we have awarded him, we will have at least the consolation of transmitting it to his family. It will bear witness across the seas that death

"itself cannot prevent the just tribute of your gratitude for services rendered to geographical science.

"The Prize Commission awards this year the Gold Medal of the Roquette Foundation to the Arctic Explorer, Francis Hall, a medal which will be sent to the family of the unfortunate explorer."

APPENDIX.

I.

INSTRUCTIONS

OF THE

NATIONAL ACADEMY

OF

SCIENCES.

I.

INSTRUCTIONS OF THE NATIONAL ACADEMY.

WASHINGTON, D. C., *June* 9, 1871.

Letter from Prof. Henry.

SIR: In accordance with the law of Congress authorizing the Expedition for explorations within the Arctic circle, the scientific operations are to be prescribed by the National Academy; and in behalf of this society I respectfully submit the following remarks and suggestions:

The appropriation for this Expedition was granted by Congress principally on account of the representations of Captain Hall and his friends as to the possibility of improving our knowledge of the geography of the regions beyond the eightieth degree of north latitude, and more especially of reaching the Pole. Probably on this account and that of the experience which Captain Hall had acquired by seven years' residence in the Arctic regions, he was appointed by the President as commander of the Expedition.

In order that Captain Hall might have full opportunity to arrange his plans, and that no impediments should be put in the way of their execution, it was proper that he should have the organization of the Expedition and the selection of his assistants. These privileges having been granted him, Captain Hall early appointed as the sailing-master of the expedition his friend and former fellow-voyager in the Arctic zone, Captain Budington, who has spent twenty-five years amid Polar ice; and for the subordinate positions, persons selected especially for their experience of life in the same regions.

It is evident from the foregoing statement that the Expedition, except in its relations to geographical discovery, is not of a scientific character, and to connect with it a full corps of scientific observers, whose duty it should be to make minute investigations relative to the physics of the globe, and to afford them such facilities with regard to time and position as would be necessary to the full success of the object of their organization, would materially interfere with the views entertained by Captain Hall, and the purpose for which the appropriation was evidently intended by Congress.

Although the special objects and peculiar organization of this Expedition are not primarily of a scientific character, yet many phenomena may be observed and specimens of natural history be incidentally col-

Letter from Prof. Henry.

lected, particularly during the long winter periods in which the vessel must necessarily remain stationary; and therefore, in order that the opportunity of obtaining such results might not be lost, a committee of the National Academy of Sciences was appointed to prepare a series of instructions on the different branches of physics and natural history, and to render assistance in procuring the scientific outfit.

Great difficulty was met with in obtaining men of the proper scientific acquirements to embark in an enterprise which must necessarily be attended with much privation, and in which, in a measure, science must be subordinate. This difficulty was, however, happily obviated by the offer of an accomplished physicist and naturalist, Dr. E. Bessels, of Heidelberg, to take charge of the scientific operations, with such assistance as could be afforded him by two or three intelligent young men that might be trained for the service. Dr. Bessels was the scientific director of the German expedition to Spitzbergen and Nova Zembla, in 1869, during which he made, for the first time, a most interesting series of observations on the depths and currents of the adjacent seas. From his character, acquirements, and enthusiasm in the cause of science, he is admirably well qualified for the arduous and laborious office for which he is a volunteer. The most important of the assistants was one to be intrusted, under Dr. Bessels, with the astronomical and magnetic observations, and such a one has been found in the person of Mr. Bryan, a graduate at Lafayette College, at Easton, Pennsylvania, who, under the direction of Professor Hilgard, has received from Mr. Schott and Mr. Keith, of the Coast Survey, practical instructions in the use of the instruments.

The Academy would therefore earnestly recommend, as an essential condition of the success of the objects in which it is interested, that Dr. Bessels be appointed as sole director of the scientific operations of the Expedition, and that Captain Hall be instructed to afford him such facilities and assistance as may be necessary for the special objects under his charge, and which are not incompatible with the prominent idea of the original enterprise.

As to the route to be pursued with the greatest probability of reaching the Pole, either to the east or west of Greenland, the Academy forbears to make any suggestions, Captain Hall having definitely concluded that the route through Baffin's Bay, the one with which he is most familiar, is that to be adopted. One point, however, should be specially urged upon Captain Hall, namely, the determination with the utmost scientific precision possible of all his geographical positions, and especially of the ultimate northern limit which he attains. The evidence of the genuineness of every determination of this kind should be made apparent beyond all question.

Letter from Prof. Henry.

On the return of the Expedition, the collections which may be made in natural history, &c., will, in accordance with a law of Congress, be deposited in the National Museum, under the care of the Smithsonian Institution; and we would suggest that the scientific records be discussed and prepared for publication by Dr. Bessels, with such assistance as he may require, under the direction of the National Academy. The importance of refusing to allow journals to be kept exclusively for private use, or collections to be made other than those belonging to the expedition, is too obvious to need special suggestion.

In fitting out the Expedition, the Smithsonian Institution has afforded all the facilities in its power in procuring the necessary apparatus, and in furnishing the outfit for making collections in the various departments of natural history. The Coast Survey, under the direction of Professor Peirce, has contributed astronomical and magnetical instruments. The Hydrographic Office, under Captain Wyman, has furnished a transit instrument, sextants, chronometers, charts, books, &c. The Signal Corps, under General Myer, has supplied anemometers, thermometers, aneroid and mercurial barometers, besides detailing a sergeant to assist in the meteorological observations. The members of the committee of the Academy, especially Professors Baird and Hilgard, have, in discussing with Dr. Bessels the several points of scientific investigation, and in assisting to train his observers, rendered important service.

The liberal manner in which the Navy Department, under your direction, has provided a vessel and especially fitted it out for the purpose with a bountiful supply of provisions, fuel, and all other requisites for the success of the Expedition, as well as the health and comfort of its members, will, we doubt not, meet the approbation of Congress, and be highly appreciated by all persons interested in Arctic explorations.

From the foregoing statement it must be evident that the provisions for exploration and scientific research in this case are as ample as those which have ever been made for any other Arctic expedition, and should the results not be commensurate with the anticipations in regard to them, the fact cannot be attributed to a want of interest in the enterprise or to inadequacy of the means which have been afforded.

We have, however, full confidence, not only in the ability of Captain Hall and his naval associates, to make important additions to the knowledge of the geography of the Polar region, but also in his interest in science and his determination to do all in his power to assist and facilitate the scientific operations.

Appended to this letter is the series of instructions prepared by the Committee of the Academy, viz: The instructions on astronomy, by Professor Newcomb; on magnetism, tides, &c., by Professor J. E. Hilgard; on meteorology, by Professor Henry; on natural history, by Pro-

Instructions by Prof. Hilgard.

fessor S. F. Baird; on geology, by Professor Meek; and on glaciers, by Professor Agassiz.

I have the honor to be, very respectfully, your obedient servant,

JOSEPH HENRY,

President of the National Academy of Sciences.

Hon. GEO. M. ROBESON,

Secretary of the Navy.

Instructions.

GENERAL DIRECTIONS IN REGARD TO THE MODE OF KEEPING RECORDS.

Record of observations.—It is of the first importance that in all instrumental observations the fullest record be made, and that the original notes be preserved carefully.

In all cases the actual instrumental readings must be recorded, and if any corrections are to be applied, the reason for these corrections must also be recorded. For instance, it is not sufficient to state the index error of a sextant; the manner of ascertaining it and the readings taken for the purpose must be recorded.

The log-book should contain a continuous narrative of all that is done by the Expedition, and of all incidents which occur on shipboard, and a similar journal should be kept by each sledge-party. The actual observations for determining time, latitude, the sun's bearing, and all notes having reference to mapping the shore, soundings, temperature, &c., should be entered in the log-book or journal in the regular order of occurrence. When scientific observations are more fully recorded in the note-books of the scientific observer than can be conveniently transcribed into the log-book, the fact of the observation and reference to the note-book should be entered.

The evidence of the genuineness of the observations brought back should be of the most irrefragable character. No erasures whatever with rubber or knife should be made. When an entry requires correction, the figures or words should be merely crossed by a line and the correct figures written above.—[J. E. H.]

ASTRONOMY.

Astronomical observations.—One of the chronometers, the least valuable if there is any difference, should be selected as the standard by which all observations are to be made, as far as practicable. The other

chronometers should all be compared with this every day at the time of winding, and the comparisons entered in the astronomical note-book. Instructions by Prof. Newcomb.

When practicable, the altitude or zenith distance of the sun should be taken four times a day—morning and evening for time; noon and midnight for latitude. The chronometer or watch times of the latitude observations, as well as of the time observations, should always be recorded. Each observation should always be repeated at least three times in all, to detect any mistake.

When the moon is visible, three measures of her altitude should be taken about the time of her passage over each cardinal point of true bearing, and the chronometer time of each altitude should be recorded.

As the Greenwich time deduced from the chronometers will be quite unreliable after the first six months, it will be necessary to have recourse to lunar distances. These should be measured from the sun, in preference to a star, whenever it is practicable to do so.

If a sextant is used in observation, a measure of the semi-diameter of the sun or moon should be taken every day or two for index error.

The observations are by no means to be pretermitted when lying in port, because they will help to correct the position of the port.

The observations should, if convenient, be taken so near the standard chronometer that the observer can signal the moment of observation to an assistant at the chronometer, who is to note the time. If this is not found convenient, and a comparing-watch is used, the watch-time and the comparison of the watch with the chronometer should both be carefully recorded.

The observations made by the main party should be all written down in full in a continuous series of note-books, from which they may be copied in the log. Particular care should be exercised in always recording the *place, date, and limb* of sun or moon observed, and any other particulars necessary to the complete understanding of the observation.—[S. N.]

Observations at winter-quarters.—The astronomical transit instrument will be set up in a suitable observatory. A meridian mark should be established as soon as practicable, and the instrument kept with constant care in the vertical plane passing through the mark, in order that all observations may be brought to bear on determining the deviation of that plane from the meridian of the place. The transits of circumpolar stars, on both sides of the pole, and those of stars near the equator, should be frequently observed.

Moon culminations, including the transits of both first and second limbs, should be observed for the determination of longitude independently of the rates of the chronometers. Twelve transits of each limb is a desirable number to obtain—more, if practicable. If any occultations of bright stars by the moon are visible, they should be likewise observed.

Instructions by Prof. Hilgard.

The observations for latitude will be made with the sextant and artificial horizon, upon stars both north and south of the zenith.

All the chronometers of the Expedition should be compared daily, as nearly as practicable about the same time.

Whenever a party leaves the permanent station for an exploration, and immediately upon its return, its chronometer should be compared with the standard chronometer of the station.

Observations during sledge or boat journeys.—The instruments to be taken are the small Casella theodolite, or a pocket sextant and artificial horizon, one or more chronometers, and a prismatic compass, for taking magnetic bearings of the sun. In very high latitudes the time of the sun's meridian altitude is not readily determined; it will be advisable, therefore, to take altitudes when the sun is near the meridian, as indicated by the compass, with regard to the variations of the compass, as derived from an isogonic chart. The time when the observation is taken will, of course, be noted by the chronometer. Altitudes should be taken in this way, both to the south and north of the zenith; they will enable the traveler to obtain his latitude at once very nearly, without the more laborious computation of the time.

The observations for time should be taken as nearly as may be when the sun is at right angles to the meridian, to the east and west, the compass being again used to ascertain the proper direction. This method of proceeding will call for observations of altitude at or near the four cardinal points, or nearly six hours apart in time.

When the party changes its place in the interval between their observations, it is necessary to have some estimate of the distance and direction traveled. The ultimate mapping of the route will mainly depend upon the astronomical observations, but no pains should be spared to make a record every hour of the estimated distance traveled—by log, if afloat—of the direction of the route, by compass, and of bearings of distant objects, such as peaks, or marked headlands, by which the route may be plotted.

In case of a few days' halt being made when a very high latitude has been reached, or at any time during the summer's explorations, a special object of care should be to ascertain the actual rate of the chronometers with the party. To this end, a well-defined, fixed object, in any direction, should be selected as a mark, the theodolite pointed on it, and the transit of the sun over its vertical observed on every day during the sojourn at the place. If the party be only provided with a sextant, then the same angular distances of the sun from a fixed object should be observed on successive days, the angles being chosen so as to be between 30° and 45°. For instance, set the sextant successively to 40°,

to 40° 20′, 40° 40′, &c., and note the time when the sun's limb comes in contact with the object. The same distances will be found after twenty-four hours, with a correction for change in the sun's declination. The sun's altitude should be observed before and after these observations, and its magnetic bearing should be noted, as well as that of the mark. The altitude of the mark should also be observed, if practicable, either with the sextant or clinometer, but this is not essential.—[J. E. H.] Instructions by Prof. Hilgard.

MAGNETISM.

On the voyage and sledge-journey, at all times when traveling, the *declination* or variation of the compass should be obtained by observing the magnetic bearing of the sun, at least once every day on which the sun is visible. On shipboard or in boats the azimuth compass is to be used; on land the small theodolite will be found preferable.

When afloat, no valuable observations of the magnetic *dip* and *intensity* are practicable. On the sledge-journey the dip-circle may be carried, and when halts are made longer than necessary to determine the place by astronomical observations, the *dip* and relative *intensity*, according to Lloyd's method, should be ascertained.

At winter-quarters, in addition to the above-mentioned observations, those of *absolute horizontal intensity* should be made with the theodolite magnetometer, including the determination of moment of inertia. Also with the same instrument the absolute declination should be determined.

The least that the observer should be satisfied with is the complete determination of the three magnetic elements, namely, declination, dip, and horizontal intensity. At one period, say within one week, three determinations of each should be made.

It is advisable that the same observations be repeated on three successive days of each month during the stay at one place; and that on three days of each month, as the 1st, 11th, and 21st, or any other days, the variation of the declination-magnet be read every half hour during the twenty-four hours; also that the magnetometer, or at least a theodolite with compass, remain mounted at all times, that the variation of the needle may be observed as often as practicable, and especially when unusual displays of *aurora borealis* take place.

In all cases the *time*, which forms an essential part of the record, should be carefully noted.

Not long before starting on a sledge-journey from a winter station, and soon after returning, the observations with the loaded dipping-needles for relative intensity should be repeated, in order to have a trustworthy comparison for the observations which have been made on the journey.

Instructions by Prof. Hilgard.

FORCE OF GRAVITY.

As the long winter affords ample leisure, pendulum experiments may be made to determine the force of gravity, in comparison with that at Washington, where observations have been made with the Hayes pendulum lent to the expedition. The record of the Washington observations, a copy of which is furnished, will serve as a guide in making the observations. Special care should be taken while they are in progress, to determine the rate of the chronometer with great precision, by observations of numerous stars with the astronomical transit instrument, the pointing of which on a fixed mark should be frequently verified.

OCEAN PHYSICS.

Depths.—Soundings should be taken frequently when in moderate depths, at least sufficiently often to give some indication of the general depth of the strait or sound in which the vessel is afloat at the time. If an open sea be reached, it should be considered of the greatest importance to get some measure of its depth, and since no bulky sounding-apparatus can be carried across the ice-barrier, the boat-party should be provided with 1,000 fathoms of small twine, marked in lengths of 10 fathoms. Stones, taken on board when the boat is launched, may serve as weights.

Bottom should be brought up whenever practicable, and specimens preserved. Circumstances of time and opportunity must determine whether a *dredge* can be used, or merely a *specimen-cup.*

Temperature of the sea should be observed with the "Miller protected bulb-thermometer" made by Casella, near the surface, about two fathoms below the surface, and near the bottom. When time permits, observations at an intermediate depth should be taken. These observations have a particular bearing on the general circulation of the ocean, and are of great importance.

Tides.—Observations of high and low water, as to time and height, should be made continuously at winter-quarters. The method adopted by Dr. Hayes is recommended. It consists of a graduated staff, anchored to the bottom, directly under the "ice-hole," by a mushroom-anchor, or heavy stone and a chain, which is kept stretched by a counterweight attached to a rope that passes over a pulley rigged overhead. The readings are taken by the height of the water in the "ice-hole." In the course of a few days' careful observations, the periods of high and low water will become sufficiently well known to predict the turns approximating from day to day, and subsequently observations taken every five minutes for half an hour, about the anticipated turn, will

suffice, provided they be continued until the turn of tide has become well marked. Instructions by Prof. Hilgard.

Tidal observations taken at other points, when a halt is made for some time, even if continued not longer than a week, will be of special value, as affording an indication as to the direction in which the tide wave is progressing, and inferentially as to the proximity of an open sea. If, as the Expedition proceeds, the tide is found to be later, the indication is that the open sea is far distant, if indeed the channel be not closed. But if the tide occurs earlier, as the ship advances, the probability is strongly in favor of the near approach to an open, deep sea, communicating directly with the Atlantic Ocean.

In making such a comparison, attention must be paid to the semi-monthly inequality in the time of high water, which may be approximately taken from the observations at winter-quarters. Observations made at the same age of the moon, in different places, may be directly compared.

When the water is open, the tide may be observed by means of a graduated pole stuck into the bottom; or, if that cannot be conveniently done, by means of a marked line anchored to the bottom and floated by a light buoy, the observation being taken by hauling up the line taut over the anchor.

Currents.—It is extremely desirable to obtain some idea of the currents in the open Polar sea if such is found. No special observations can be indicated, however, except those of the drift of icebergs, if any should be seen.

Density.—The *density* of the sea-water should be frequently observed with delicate hydrometers, giving direct indications to the fourth decimal. Whenever practicable, water should be brought up from different depths, and its density tested. The specimens should be preserved in carefully-sealed bottles, with a view to the subsequent determination of their mineral contents.—[J. E. H.]

METEOROLOGY.

The Expedition is well supplied with meteorological instruments, all the standards, with the exception of the mercurial barometers, manufactured by Casella, and compared with the standards of the Kew Observatory under the direction of Professor Balfour Stewart. Dr. Bessels is so familiar with the use of instruments, and so well acquainted with the principles of meteorology, that minute instructions are unnecessary. We shall therefore merely call attention, by way of remembrance, to the several points worthy of special notice.

Temperature.—The registers of the temperature, as well as of the barometer, direction of the wind, and moisture of the atmosphere, should,

Instructions by Prof. Henry.

in all cases in which it is possible, be made hourly, and when that cannot be done, they should be made at intervals of two, three, four, or six hours. The temperature of the water of the ocean, as well as of the air, should be taken during the sailing of the vessel.

The minimum temperature of the ice, while in winter-quarters, should be noted from time to time, perhaps at different depths; also that of the water beneath.

The temperature of the black-bulb thermometer *in vacuo* exposed to the sun, and also that of the black-bulb free to the air, should be frequently observed while the sun is on the meridian, and at given altitudes in the forenoon and afternoon, and these observations compared with those of the ordinary thermometer in the shade.

Experiments should also be made with a thermometer in the focus of the silvered mirror, the face of which is directed to the sky. For this purpose the ordinary black-bulb thermometer may be used as well as the naked-bulb thermometer. The thermometer thus placed will generally indicate a lower temperature than one freely exposed to radiation from the ground and terrestrial objects, and in case of isolated clouds will probably serve to indicate those which are colder and perhaps higher.

Comparison may also be made between the temperature at different distances above the earth by suspending thermometers on a spar at different heights.

The temperature of deep soundings should be taken with the thermometer with a guard, to obviate the pressure of the water. As the tendency, on account of the revolution of the earth, is constantly to deflect all currents to the right hand of the observer looking down stream, the variations in temperature in connection with this fact may serve to assist in indicating the existence, source, and direction of currents.

The depth of frost should be ascertained, and also, if possible, the point of invariable temperature. For this purpose, augers and drills with long stems for boring deeply should be provided.

Pressure of air.—A series of comparative observations should be made of the indications of the mercurial and aneroid barometers. The latter will be affected by the variation of gravity as well as of temperature, while the former will require a correction due only to heat and capillarity.

As it is known that the normal height of the barometer varies in different latitudes, accurate observations in the Arctic regions, with this instrument, are very desirable, especially in connection with observations on the moisture of the atmosphere, since to the small quantity of this in northern latitudes the low barometer which is observed there has been attributed. I think, however, it will be found that the true

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cause is in the rotation of the earth on its axis, which, if sufficiently rapid, would project all the air from the Pole.

In the latitude of about 60, there is a belt around the earth in which the barometer stands unusually high, and in which violent fluctuations occur. This will probably be exhibited in the projection of the curve representing the normal height of the barometrical column in different latitudes.

Moisture.—The two instruments for determining the moisture in the air are the wet and dry bulb thermometer and the dew-point instrument, as improved by Regnault. But to determine the exact quantity in the atmosphere in the Arctic regions will require the use of an aspirator, by which a given quantity of air can be passed through an absorbing substance, such as chloride of calcium, and the increase of weight accurately ascertained. It may, however, be readily shown that the amount is very small in still air.

A wind from a more southern latitude will increase the moisture, and may give rise to fogs. Sometimes, from openings in the ice, vapor may be exhaled from water of a higher temperature than the air, and be immediately precipitated into fog.

The inconvenience which is felt from the moisture which exhales with the breath in the hold of the vessel may, perhaps, be obviated by adopting the ingenious expedient of one of the Arctic voyagers, viz, by making a number of holes through the deck and inverting over them a large metallic vessel like a pot. The exterior of this vessel, being exposed to the low temperature of the air without, would condense the moisture from within on its interior surface, and thus serve, on the principle of the diffusion of vapor, to desiccate the air below.

The variation of moisture in the atmosphere performs a very important part in all meteorological changes. Its effects, however, are probably less marked in the Arctic regions than in more southern latitudes. The first effect of the introduction into the atmosphere of moisture is to expand the air and to diminish its weight; but after an equilibrium has taken place, it exists, as it were, as an independent atmosphere, and thus increases the pressure. These opposite effects render the phenomena exceedingly complex.

Winds.—As to these, the following observations are to be regularly and carefully registered, namely: The average velocity as indicated by Robinson's anemometer; the hour at which any remarkable change takes place in their direction; the course of their veering; the existence at the same time of currents in different directions, as indicated by the clouds; the time of beginning and ending of hot or cold winds, and the direction from which they come. Observations on the force and direction of the wind are very important. The form of the wind-vane should

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be that of which the feather part consists of two planes, forming between them an angle of about 10°. The sensibility of this instrument, provided its weight be not too much increased, is in proportion to the surface of the feather planes. Great care must be taken to enter the direction of the wind from the true meridian, whenever this can be obtained, and in all cases to indicate whether the entries refer to the true or magnetic north. Much uncertainty has arisen on account of the neglect of this precaution.

In accordance with the results obtained by Professor Coffin, in his work on the resultant direction of the wind, there are, in the northern hemisphere, three systems roughly corresponding with the different zones, viz, the Tropical, in which the resultant motion is toward the west, the Temperate, toward the east, and the Arctic, in which it is again toward the west.

In the discussion of all the observations, the variation of the temperature and the moisture will appear, in their connection with the direction of the wind. Hence the importance of simultaneous observations on these elements, and also on the atmospheric pressure.

Precipitation.—The Expedition will be furnished with a number of rain-gauges, the contents of which should be measured after each shower. By inverting and pressing them downward into the snow, and subsequently ascertaining, by melting in the same vessel, the amount of water produced, they will serve to give the precipitation of water in the form of snow. The depth of snow can be measured by an ordinary measuring-rod. Much difficulty, however, is sometimes experienced in obtaining the depth of snow, on account of its drifting, and it is sometimes not easy to distinguish whether snow is actually falling or merely being driven by the wind.

The character of the snow should be noted, whether it is in small rounded masses, or in regular crystals; also the conditions under which these different forms are produced.

The form and weight of hailstones should be noted, whether consisting of alternate strata, the number of which is important, of flocculent snow, or solid ice, or agglutinations of angular crystals, whether of a spherical form, or that of an oblate spheroid.

The color of the snow should be observed in order to detect any organisms which it may contain, and also any sediment which may remain after evaporation, whether of earthy or vegetable matter.

Clouds.—The character of the clouds should be described, and the direction of motion of the lower and the higher ones registered, at the times prescribed for the other observations. Since the Expedition is well supplied with photographic apparatus, frequent views of the clouds and of the general aspect of the sky should be taken.

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Aurora.—Every phase of the *aurora borealis* will of course be recorded; also the exact time of first appearance of the meteor, when it assumes the form of an arch or a corona, and when any important change in its general aspect takes place. The magnetic bearing of the crown of the arch, and its altitude at a given time, should be taken; also, if it moves to the south of the observer, the time when it passes the zenith should be noted. The time and position of a corona are very important. Two distinct arches have sometimes been seen co-existing—one in the east and the other in the west. In such an exhibition, the position of the crown of each arch should be determined. Drawings of the aurora, with colored crayons, are very desirable. In lower latitudes a dark segment is usually observed beneath the arch, the occurrence of which, and the degree of darkness, should be registered. It also sometimes happens that a sudden precipitation of moisture in the form of a haziness is observed to cover the face of the sky during the shooting of the beams of the aurora. Any appearance of this kind is worthy of attention.

Wave-motions are sometimes observed, and it would be interesting to note whether these are from east to west or in the contrary direction, and whether they have any relation to the direction of the wind at the time. The colors of the beams and the order of their changes may be important in forming a theory of the cause of the phenomena. Any similarity of appearance to the phenomena exhibited in Geissler's tubes should be noted, especially whether there is anything like stratification.

The aurora should be frequently examined by the spectroscope, and the bright lines which may be seen, carefully compared with one of Kirchoff's maps of the solar spectrum.

To settle the question as to the fluorescence of the aurora and its consequent connection with the electric discharge, a cone of light reflected from the silver-plated mirror should be thrown on a piece of white paper, on which characters have been traced with a brush dipped in sulphate of quinine. By thus condensing the light on the paper, any fluorescence which the ray may contain will be indicated by the appearance of the previously invisible characters in a green color.

Careful observations should be made to ascertain whether the aurora ever appears over an expanse of thick ice, or only over land or open water, ice being a non-conductor of electricity.

The question whether the aurora is ever accompanied with a noise has often been agitated, but not yet apparently definitely settled. Attention should be given to this point, and perhaps the result may be rendered more definite by the use of two ear-trumpets, one applied to each ear.

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According to Hansteen, the aurora consists of luminous beams, parallel to the dipping needle, which at the time of the formation of the corona are shooting up on all sides of the observer, and also the lower portions of these beams are generally invisible. It is, therefore, interesting to observe whether the auroral beams are ever interposed between the observer and a distant mountain or cloud, especially when looking either to the east or west.

The effect of the aurora on the magnetism of the earth will be observed by abnormal motion of the magnetic instruments for observing the declination, inclination, and intensity. This effect, however, may be more strikingly exhibited by means of a galvanometer, inserted near one end of a long insulated wire extended in a straight line, the two extremities of which are connected with plates of metal plunged in the water, it may be through holes in the ice, or immediately connected with the ground.

To ascertain whether the effect on the needle is due to an electrical current in the earth, or to an inductive action from without, perhaps the following variation of the preceding arrangement would serve to give some indication. Instead of terminating the wire in a plate of metal, plunged in the water, let each end be terminated in a large metallic insulated surface, such, for example, as a large wooden disk, rounded at the edges and covered with tin-foil. If the action be purely inductive, the needle of the galvanometer inserted, say, near one end of the wire, would probably indicate a momentary current in one direction, and another in the opposite, at the moment of the cessation of the action. For the purpose of carrying out this investigation, the Smithsonian Institution has furnished the Expedition with two reels of covered wire, each a mile in length, one of which is to be stretched in the direction, perhaps, of the magnetic meridian, and the other at right angles to it. It would be well, however, to observe the effect with the wires in various directions, or united in one continuous length.

Electricity.—From the small amount of moisture in the atmosphere, and the consequent insulating capacity of the latter, all disturbances of the electrical equilibrium will be seen in the frequent production of light and sparks on the friction and agitation of all partially non-conducting substances. Any unusual occurrences of this kind, such as electrical discharges from pointed rods, from the end of spars, or from the fingers of the observer, should be recorded.

A regular series of observations should be made on the character and intensity of the electricity of the atmosphere by means of an electrometer, furnished with a polished, insulated, metallic ball, several inches in diameter, and two piles of Deluc to indicate the character of the electricity, whether + or —; and also supplied with a scale to measure, by

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the divergency of a needle, the degree of intensity. This instrument can be used either to indicate the electricity of the air by induction or by conduction. In the first case it is only necessary to elevate it above a normal plane by means of a flight of steps, say eight or ten feet, to touch the ball at this elevation and again to restore it to its first position, when it will be found charged with electricity of the same character as that of the air. Or the ball may be brought in contact with the lower end of an insulated metallic wire, to the upper end of which is attached a lighted piece of twisted paper which had been dried after previous saturation in a solution of nitrate of lead.

Thunder-storms are rare in the Arctic regions, although they sometimes occur; and in this case it is important to observe the point in the horizon in which the storm-cloud arises; also the direction of the wind during the passage of the storm over the place of the observer; and also the character of the lightning—whether zig-zag, ramified, or direct; also its direction—whether from cloud to cloud, or from a cloud to the earth.

Optical phenomena.—Mirage should always be noted, as it serves to indicate the position of strata of greater or less density, which may be produced by open water, as in the case of lateral mirage, or by a current of wind or warmer air along the surface.

The polarization of the light of the sky can be observed by means of a polariscope, consisting of a plate of tourmaline with a slice of Iceland spar, or a crystal of nitre cut at right angles to its optical axis, on the side farthest from the eye. With this simple instrument the fact of polarization is readily detected, as well as the plane in which it is exhibited.

Halos, parhelia, coronæ, luminous arches, and glories should all be noted, both as to time of appearance and any peculiarity of condition of the atmosphere. Some of these phenomena have been seen on the surface of the ice by the reflection of the sun's beams, from a surface on which crystals had been formed by the freezing of a fog simultaneously with a similar appearance in the sky, the former being a continuation, as it were, and not a reflection of the latter.

In the latitude of Washington, immediately after the sun has sunk below the western horizon, there frequently appear faint parallel bands of colors just above the eastern horizon, which may very possibly be due to the dispersion of the light by the convex form of the atmosphere, and also, at some times, slightly-colored beams crossing the heavens like meridians, and converging to a point in the eastern horizon. Any appearance of this kind should be carefully noted and described.

Meteors.—Shooting stars and meteors of all kinds should be observed with the spectroscope. The direction and length of their motion should

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be traced on star-maps, and special attention given at the stated periods in August and November. A remarkable disturbance of the aurora has been seen during the passage of a meteor through its beams. Any phenomenon of this kind should be minutely described.

Ozone.—The Expedition is furnished with a quantity of ozone test-paper, observations with which can only be rendered comparable by projecting against the sensitized paper a given quantity of atmospheric air. For this purpose an aspirator should be used, which may be made by fastening together two small casks, one of which is filled with water, with their axes parallel, by means of a piece of plank nailed across the heads, through the middle of which is passed an iron axis, on which the two casks may be made to revolve, and the full cask may readily be placed above the empty, so that its contents may gradually descend into the latter. During the running of the water from the upper cask, an equal quantity of air is drawn through a small adjutage into a closed vessel and made to impinge upon the test-paper. The vessel containing the test-paper should be united with the aspirator by means of an India-rubber tube.

Miscellaneous.—The conduction of sound during still weather, through the air over the ice, through the ice itself, and through the water, may be studied.

Evaporation of snow, ice, and water may be measured by a balance, of which the pan is of a given dimension.

Experiments on the resistance of water to freezing in a confined space at a low temperature may be made with small bomb-shells closed with screw-plugs of iron. The fact of the liquidity of the water at a very low temperature may be determined by the percussion of a small iron bullet, or by simply inverting the shell, when the ball, if the liquid remains unfrozen, will be found at the lowest point. It might be better, however, to employ vessels of wrought iron especially prepared for the purpose, since the porosity of cast iron is such that the water will be forced through the pores, *e. g.*, the lower end of a gun-barrel, which, from the smallness of its diameter, will sustain an immense pressure, and through which the percussion of the inclosed bullet may be more readily heard. Water, in a thin metallic vessel, exposed on all sides to the cold, sometimes gives rise to hollow crystals of a remarkable shape and size, projecting above the level surface of the water, and exhibits phenomena worthy of study.

Experiments may be made on regelation, the plasticity of ice, the consolidation of snow into ice, the expansion of ice, its conducting power for heat, and the various forms of its crystallization. The effect of intense cold should be studied on potassium, sodium, and other substances, especially in relation to their oxidation.

Instructions by Prof. Baird.

The melting-point of mercury should be observed, particularly as a means of correcting the graduation of thermometers at low temperatures. The resistance to freezing of minute drops of mercury, as has been stated, should be tested. Facts long observed, when studied under new conditions, scarcely ever fail to yield new and interesting results.—[J. H.]

NATURAL HISTORY.

Objects of natural history of all kinds should be collected, and in as large numbers as possible. For this purpose all on board the vessel, both officers and sailors, should be required to collect, upon every favorable opportunity, and to deliver the specimens obtained to those appointed to have charge of them.

Zoology.—The terrestrial mammals of Greenland are pretty well known, but it is still desirable that a series, as complete as possible, of the skins should be preserved, great care being taken to always indicate, upon the label to be attached, the sex and probable age, as well as the locality and date of capture. The skeleton, and, when it is not possible to get this complete, any detached bones, particularly the skull and attached cervical vertebræ, are very desirable. Interesting soft parts, especially the brain, and also embryos, are very important. If it should be considered necessary to record measurements, they should be taken from specimens recently killed.

Of walruses and seals, there should be collected as many skeletons as possible, of old and young individuals; also skins, especially of the seals. Notes should be made regarding the habits in general, food, period of copulation, duration of gestation and time of migration, it being desirable to find out whether their migrations are periodical.

Of the *Cetacea*, when these are too large to be taken on board the vessel, the skull and cervical vertebræ, the bones of the extremities and penis, and whatever else may be deemed worthy of preservation, should be secured. All the animals should be examined for ecto- and ento-parasites, and the means by which they become affixed to the animals noted.

Collect carefully the species of *Myodes* (*lemmings*), *Arctomys*, and *Arvicola*, so as to determine the variations with locality and season. The relationship of two kinds of foxes, the blue and white, should be studied to determine their specific or other relationship. Any brown bears should be carefully collected, both skin and skeleton, to determine whether identical or not with the Old World *Ursus arctus*.

Reference has already been made to the seals and cetaceans; of these the *Phoca cristata*, the white whale (*Beluga*), and the *Monodon* are particularly desired.

What has been said in regard to the mammals will apply equally well to the *birds*, skins and skeletons being equally desirable. It is especially

Instructions by Prof. Baird.

important that the *fresh colors* of the bill, cere, gums, eyes, and feet, or caruncles, or bare skin, if there be any, should be noted, as the colors of these parts all change after the preparation of a specimen.

Of birds, the smaller land species are of the greatest interest, and complete series of them should be gathered. The northern range of the insectivorous species should be especially inquired into. The Arctic falcons should be collected in all their varieties, to ascertain whether there are two forms, a brown and a white, distinct through life, or whether one changes with age into the other.

Inquiry should be directed to the occurrence of *Bernicla leucopsis*, *Anser cinereus*, or other large gray geese, and the *Camptolæmus Labradora*, and a large number of specimens, of the latter especially, should be obtained. Indeed the geese and ducks generally should form subjects of special examination. Among the *Laridæ* the most important species is the *Larus rossii* or *Rhodostethia rosea*, scarcely known in collections. A large number of skins and eggs will be a valuable acquisition. *Larus eburneus* is also worthy of being collected. The *Alcidæ* should be carefully examined for any new forms, and inquiries directed in regard to the *Alca impennis*.

Of all birds' eggs an ample store should be gathered; and the skeletons of the Arctic *Raptores* and the *Natatores* generally.

It will be a matter of much importance to ascertain what is the extreme northern range of the continental species of birds, and whether, in the highest latitudes, the European forms known to occur in Greenland cross Baffin's Bay.

Eggs and nests of birds, in as large numbers as possible, should be procured, great care being taken, however, in all cases to identify them by the parents which may be shot, and some portion, if not all of them, preserved, if not recognized by the collector. All the eggs of one set should be marked with the same number, that they may not be separated; the parent bird, if collected, likewise receiving the same number. It should also be stated, if known, how long the eggs have been set upon, as incubation influences very much their color; the situation of the nest also is very important. Notes on the manner of nesting, localities selected, and other peculiarities of breeding, should be carefully kept; whether they are polygamous, whether there are struggles between the males, and the manner in which the old birds feed their young; and whether these remain helpless in the nest for a given time, or whether they accompany the parents from birth. A journal of the arrival and departure of the migratory species should also be kept, to find out whether those which leave latest return earliest, and *vice versa*.

Of fishes that are obtained, the best specimens should be photographed,

the fresh colors noted, and then they should be preserved in alcohol or carbolic acid. Instructions by Prof. Baird.

Among the fishes the *Salmonidæ*, *Cottidæ*, *Gadidæ*, and *Clupeidæ* will be of most interest, and good series should be secured.

The terrestrial inferior animals should be all collected, each class in its appropriate way.

Try to get larvæ of insects, and observe their life, whether they are well adapted to their surroundings; for in proportion to the insects are the number of insectivorous animals, and for that reason the struggle for life would be more energetic, and, therefore, only those insects which are best adapted to the conditions will survive.

Inferior marine animals are usually collected by two methods, viz, with a pelagic net and by a dredge. Both these methods should be employed whenever practicable. Especial attention should be paid to the larvæ, of which sketches should be made. The results of the dredging should be noted in blanks printed for this purpose, the specimens to be preserved as their constitution requires. Muller's liquor, glycerine, solution of alcohol and sugar, &c.

It would be of peculiar interest to study the several deep regions, admitted by Forbes and others, to ascertain if in the Arctic regions the intensity of color increases with the depth, as has been stated to be the case with red and violet, which, if true, would be just the contrary to what is observed in the temperate and tropical regions.

Of shells two sets should be preserved, one dry and the other *with the animal*, in alcohol; the dry shell is necessary from the fact that the alcohol, by the acetic acid produced, is apt to destroy the color.

It is particularly important to get as full a series as possible of the members of the smaller families, with a view to the preparation of monographs.

There should be paid as much attention as possible to the fauna of fresh-water lakes to ascertain whether they contain marine forms, as has been found to be the case with some of those in North America, Scandinavia, Italy, and other countries. From this, important conclusions regarding the rising of the coast may be arrived at.

Botany.—Plants are to be collected in two ways. Of each species some specimens should be put in alcohol to serve for studying the anatomy; the others to be dried between sheets of blotting-paper. The locality of each specimen should be noted, also its situation, the character of the soil and height above the sea, the season, and whether there is *heliotropismus*, &c., &c. In the general notes there should be remarks on the horizontal and vertical distribution.—[S. F. B.]

GEOLOGY.

The most important point in the collection of geological specimens, whether they consist of rocks, minerals, or fossils, is, that on breaking

Instructions by Prof. Meek.

or digging them from the matrix or bed, each individual specimen should be carefully wrapped separately in pliable but strong paper, with a label designating the exact locality from which it was obtained. If two or more beds of rock (sandstone, limestone, clay, marl, or other material) occur at the locality from which specimens are taken, the label should also have a number on it corresponding to the particular bed in which it was found, as designated in a section made on the spot in a note-book. This should be done in order that the specimens from each bed may be separated from those found in others, whether the beds are separable by differences of composition or by differences in the groups of fossils found in each; and it is, moreover, often important that this care should be observed, even when one or more of the beds are of inconsiderable thickness, if such beds are characterized by peculiar fossils. For in such cases it often happens that what may be a mere seam at one place may represent an important formation at another.

Specimens taken directly from rocks in place are, of course, usually more instructive than those found loose; but it often happens that much better specimens of fossils can be found already weathered out, and lying detached about an outcrop of hard rock, than can be broken from it. These can generally be referred to their place in the section noted at the locality, by adhering portions of the matrix, or from finding more or less perfect examples of the same species in the beds in place; but it is usually the better plan to note on the labels of such specimens that they were found loose, especially if there are any evidences that they may have been transported from some other locality by drift agencies.

All exposures of rocks, and especially those of limestone, should be carefully examined for fossils, for it often happens that hard limestones and other rocks that show no traces of organic remains on the natural surfaces (covered, as they often are, with lichens and mosses), will be found to contain fossils when broken into. In cases where fossils are found to exist in a hard rock, if time and other circumstances permit, it is desirable that it should be vigorously broken with a heavy hammer provided for that purpose, and as many specimens of the fossils as possible (or as the means of transportation will permit) should be collected.

Fossils from rocks of all ages will, of course, be interesting and instructive, but it is particularly desirable that organic remains found in the later tertiary and quarternary formations of these high northern latitudes, if any such exist there, should be collected. These, whether of animals or plants, would throw much light on the question respecting

the climatic conditions of the Polar regions at or just preceding the advent of man. Instructions by Prof. Meek.

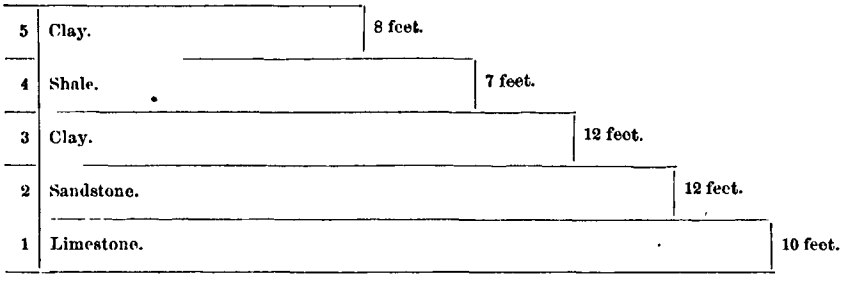
Specimens illustrating the lithological character of all the rocks observed in each district explored should also be collected, as well as of the organic remains found in fossiliferous beds; also, of all kinds of minerals. Those of rocks and amorphous minerals should be trimmed to as nearly the same size and form as can conveniently be done—say 3 by 4 inches wide and long and $1\frac{1}{4}$ inches in thickness. Crystalline minerals ought, of course, to be broken from the matrix, rather with the view of preserving the crystals, as far as possible, than with regard to the size or form of the hand specimens; and the same remark applies equally to fossils.

On an overland journey the circumstances may not *always* be such as to allow the necessary time to wrap carefully and label specimens on the spot where they were collected; but in such cases numbers, or some other marks, should be scratched with the point of a knife, or other hard-pointed instrument, on each, by means of which the specimens collected at different times and places during the march can be correctly separated, labeled, and wrapped when the party stops for rest.

All specimens should be packed tightly in boxes as soon as enough have been collected to fill a box, and a label should be attached to each box indicating the particular district of country in which the collections were obtained. For this purpose, empty provision-boxes or packages can generally be used.

In examining sections or exposures of rocks along a shore or elsewhere, it is a good plan to make a rough sketch in a note-book, thus:

SECTION 1.

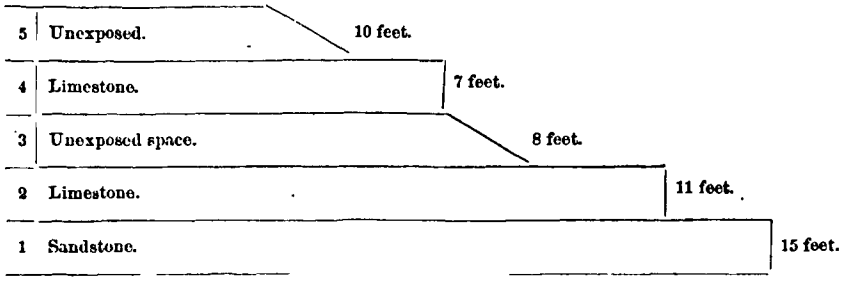


Then, on the same or following pages, more particular descriptions of the nature and composition of the several beds should be written, referring to each by its number. Sections of this kind should be numbered 1, 2, 3, and so on, in the order in which they were observed, and the specimens from each bed ought also to be numbered on its label, so as to correspond. That is, specimens from the lowest bed of the first sec-

Instructions by Prof. Meek.

tion should be, for instance, marked thus: "Section No. 1, bed No. 1," and so on. The name of the locality, however, should also, as already suggested, be written on the labels as a provision against the possible loss of note-books.

It generally happens that an outcrop will show only a part of the beds of which it is composed, thus:



In such a case the facts should be noted exactly as seen, without any attempt to guess at the nature of the material that may fill the unexposed spaces; but generally, by comparing different sections of this kind taken in the same region, the entire structure of a district may be made out.

The dip and strike of strata should also be carefully observed and noted, as well as the occurrence of dikes or other outbursts of igneous rocks, and the effects of the latter on the contiguous strata.

All evidences of the elevation or sinking of coasts should likewise be carefully observed and noted.

Especial attention should be given to glacial phenomena of every kind, such as the formation, size, movements, &c., of existing glaciers, their abrading and other effects upon the subjacent rocks, their formation of moraines, &c.; also, the formation, extent, and movements of icebergs, and their power of transporting masses of rock, &c.

At Cape Fraser, between latitude 80° north and longitude 70° west, Dr. Hayes found some upper silurian fossils in a hard gray limestone. This rock doubtless has a rather wide extension in the country referred to, as other explorers have brought silurian fossils from several localities further southward and westward in this distant northern region. Should the party visit the locality from which Dr. Hayes collected his specimens, it is desirable that as complete a collection as possible should be obtained, as most of those found by Dr. Hayes were lost.

For making geological observations and collecting geological specimens, very few instruments are required. For determining the elevations of mountains and the general altitude of the country, a barometer is sufficiently accurate. For local elevations of less extent, a pocket-

level (Locke's) should be provided. Tape-lines are also useful for measuring vertical outcrops and other purposes; and a good pocket-compass is indispensable. The latter should have a clinometer attached. Instructions by Prof. Agassiz.

A good supply of well-tempered cast-steel hammers should also be provided. They should be of various sizes and forms, and ought to be made with large enough eyes to receive stout handles, of which a good number, made of well-seasoned hickory, should be prepared. Chisels of different sizes should also be prepared of well-tempered steel.

A pouch of leather or stout canvas, with a strap to pass over the shoulder, will be found useful to carry specimens for short distances.—[F. B. M.]

GLACIERS.

The progress of our knowledge of glaciers has disclosed two sides of the subject entirely disconnected with one another, and requiring different means of investigation. The study of the structure of glaciers as they exist now, and the phenomena connected with their formation, maintenance, and movement, constitute now an extensive chapter in the physics of the globe. On the other hand, it has been ascertained that glaciers had a much wider range during an earlier, but nevertheless comparatively recent geological period, and have produced during that period phenomena which, for a long time, were ascribed to other agencies.

In any investigation of glaciers nowadays, the student should keep in mind distinctly these two sides of the subject. He ought also to remember at the outset what is now no longer a mooted point, that, at different times during the glacial period, the accumulations of ice covering larger or smaller areas of the earth's surface have had an ever-varying extension, and that whatever facts are observed, their value will be increased in proportion as the chronological element is kept in view.

From the physical point of view, the Arctic expedition under the command of Captain Hall may render science great service should Dr. Bessels have an opportunity of comparing the present accumulations of ice in the Arctic regions with what is known of the glaciers of the Alps and other mountainous regions. In the Alps, the glaciers are fed from troughs in the higher regions, in which snow accumulates during the whole year, but more largely during winter, and by a succession of changes is gradually transformed into harder and harder ice, moving down to lower regions where glaciers never could have been formed. The snow-like accumulations of the upper regions are the materials out of which the compact transparent brittle ice of the lower glaciers is made. Whatever snow falls upon the glaciers in their lower range during winter melts away during summer, and the glacier is chiefly fed

Instructions by Prof. Agassiz.

from above and wastes away below. The water arising from the melting of the snow at the surface contributes only indirectly to the internal economy of the glacier. It would be superfluous here to rehearse what is known of the internal structure of glaciers and of their movement; it may be found in any treatise on glaciers. Nor would it be of any avail to discuss the value of conflicting views concerning their motion. Suffice it to say that an Arctic explorer may add greatly to our knowledge by stating distinctly to what extent the winter snow, falling upon the surface of the great glacial fields of the Arctic, melts away during summer and leaves bare an old icy surface covered with fragments of rock, sand, dust, &c. Such an inquiry will teach us in what way the great masses of ice which pour into the Arctic Ocean are formed, and how the supply that empties annually into the Atlantic is replenished. If the winter snows do not melt entirely in the lower part of the Arctic glaciers during summer, these glaciers must exhibit a much more regular stratification than the Alpine glaciers, and the successive falls of snow must in them be indicated more distinctly by layers of sand and dust than in those of the Alps by the dirt-bands. Observations concerning the amount of waste of the glaciers by evaporation or melting, or what I have called *ablation* of the surface during a given time in different parts of the year, would also be of great interest as bearing upon the hygrometric condition of the atmosphere. A pole sunk sufficiently deep into the ice to withstand the effects of the wind could be used as a meter. But it ought to be sunk so deep that it will serve for a period of many months and rise high enough not to be buried by a snow-storm. It should also be ascertained, if possible, whether water oozes from below the glacier, or, in other words, whether the glacier is frozen to the ground or separated from it by a sheet of water. If practicable, a line of poles should be set out with reference to a rocky peak or any bare surface of rock, in order to determine the motion of the ice. It is a matter of deep interest with reference to questions connected with the former greater extension of glaciers, to know in what manner flat sheets of ice move on even ground, exhibiting no marked slope. It may be possible to ascertain, after a certain time, by the change of position of poles sunk in the ice, whether the motion follows the inequalities of the surface or is determined by the lay of the land and the exposure of the ice to the atmospheric agents, heat, moisture, wind, &c. It would be of great interest to ascertain whether there is any motion during the winter season, or whether motion takes place only during the period when water may trickle through the ice. The polished surfaces in the immediate vicinity of glacier ice exhibit such legible signs of the direction in which the ice moves, that wherever ledges of rocks are exposed, the scratches and furrows upon their sur-

face may serve as a sure register of its progress; but before taking this as evidence, it should, if possible, be ascertained that such surfaces actually belong to the area over which the adjoining ice moves during its expansion, leaving them bare in its retreat. Instructions by Prof. Agassiz.

The geological agency of glaciers will no doubt receive additional evidence from a careful examination of this point in the Arctic regions. A moving sheet of ice, stretching over a rocky surface, leaves such unmistakable marks of its passage that rocky surfaces which have once been *glaciated*, if I may thus express the peculiar action of ice upon rocks, viz, the planing, polishing, scratching, grooving, and furrowing of their surfaces, can never be mistaken for anything else, and may everywhere be recognized by a practiced eye. These marks, in connection with transported loose materials, drift, and bowlders, are unmistakable evidence of the great extension which glaciers once had. But here it is important to discriminate between two sets of facts, which have generally been confounded. In the proximity of existing glaciers, these marks and these materials have a direct relation to the present sheet of ice near by. It is plain, for instance, that the polished surfaces about the Grimsel, and the loose materials lying between the glacier of the Aar and the Hospice, are the work of the glacier of the Aar when it extended beyond its present limits, and step by step its greater extension may be traced down to Meyringen, and in connection with other glaciers from other valleys of the Bernese Oberland, it may be tracked as far as Thun or Berne, when the relation to the Alps becomes complicated with features indicating that the whole valley of Switzerland, between the Alps and the Jura, was once occupied by ice. On the other hand, there are evident signs of the former presence of local glaciers in the Jura, as, for instance, on the Dent de Vaulion, which mark a later era in the history of glaciation in Switzerland. Now the traces of the former existence of extensive sheets of ice over the continent of North America are everywhere most plainly seen, but no one has yet undertaken to determine in what relation these glaciated surfaces of past ages stand to the ice-fields of the present day in the Arctics. The scientific men connected with Captain Hall's expedition would render science an important service if they could notice the trend and bearing of all the glacial scratches they may observe upon denudated surfaces wherever they land. It would be advisable for them, if possible, to break off fragments of such glaciated rocks and mark with an arrow their bearing. It would be equally important to notice how far the loose materials, pebbles, bowlders, &c., differ in their mineralogical character from the surface on which they rest, and to what extent they are themselves polished, rounded, scratched, or furrowed, and also what is the nature of the clay or sand which holds them together. It would be

Instructions by Prof. Agassiz.

particularly interesting to learn how far there are angular bowlders among these loose materials, and what is their position with reference to the compacted drift made up of rounded, polished, and stratched pebbles and bowlders. Should an opportunity occur of tracing the loose materials of any locality to some rock *in situ*, at a greater or less distance, and the nature of the materials should leave no doubt of their identify, this would afford an invaluable indication of the direction in which the loose materials have traveled. Any indication relating to the differences of level among such materials would add to the value of the observation. I have purposely avoided all theoretical considerations, and only call attention to the facts which it is most important to ascertain, in order to have a statement as unbiased as possible.—[L. A.]

NOTE.—These Instructions of the National Academy of Sciences, as here given, are to be found in the Secretary of the Navy's Report for 1871.

II.

CORRESPONDENCE

BETWEEN THE

BRITISH ADMIRALTY

AND THE

UNITED STATES NAVY DEPARTMENT

IN RELATION TO THE

STORES LEFT BY THE POLARIS EXPEDITION ON THE WEST COAST OF GREENLAND.

II.

CORRESPONDENCE.

SECRETARY OF ADMIRALTY TO UNDER SECRETARY OF STATE FOR FOREIGN AFFAIRS.

Letters.
Sec. of Admiralty.
Under Sec. of State.

ADMIRALTY, *4th December*, 1874.

SIR: I am commanded by my Lords Commissioners of the Admiralty to request that you will move the Earl of Derby to cause inquiries to be made of the Government of the United States whether any of the stores or provisions sent out for the relief of the "Polaris" Expedition are still in the depôt on the west coast of Greenland, and, if so, whether the Polar expedition of 1875 may consider them available for use on giving proper receipts.

In the event of the stores at the depôt being placed at the disposal of the expedition, my Lords request that they may be furnished with a list of all such stores, provisions, &c.

I am, &c.,

(Signed) ROBERT HALL.

The UNDER SECRETARY OF STATE, &c., &c., &c.

Foreign Office.

MR. LISTER TO SECRETARY OF THE ADMIRALTY.

FOREIGN OFFICE, *9th February*, 1875.

SIR: With reference to your letter of the 4th of December, I am directed by the Earl of Derby to transmit to you, to be laid before the Lords Commissioners of the Admiralty, a copy of a despatch from Sir Edward Thornton, forwarding the reply of the United States Government to the application which he was instructed to make to them in regard to the stores of the "Polaris" Expedition, and I am to request you to move their Lordships to inform Lord Derby whether they would wish Sir Edward Thornton to be instructed to convey the thanks of Her Majesty's Government to the United States Government for the liberal way in which they have placed the stores in question at the disposal of the Arctic expedition about to be despatched from this country.

I am, &c.,

(Signed) T. V. LISTER.

The SECRETARY, *Admiralty.*

WASHINGTON, *25th January*, 1875.

Letters. British minister. Sec. of State.

MY LORD: In compliance with the instruction contained in your Lordship's despatch, No. 364, of 12th ultimo, I addressed a note to Mr. Fish, inquiring whether the stores sent to Greenland by the United States Government for the relief of the "Polaris" Expedition could be made available for the use of the Arctic Expedition about to be despatched by Her Majesty's Government.

I have now the honour to transmit copies of Mr. Fish's reply, and of its enclosures, from which your Lordship will perceive that the United States Government is willing to place at the disposal of that expedition all or any of the above-mentioned stores which can be found.

I have requested Mr. Fish to offer my thanks to the United States Secretary of the Navy for the readiness with which he has complied with the request of Her Majesty's Government, and for the good wishes for the success of the British Expedition which he conveys on behalf of the Navy Department.

I have, &c.,

(Signed) EDWARD THORNTON.

The EARL OF DERBY, &c., &c.

DEPARTMENT OF STATE,
Washington, January 23, 1875.

SIR: I had the honor to inform you in my note of the 29th ultimo that I had referred to the Secretary of the Navy a copy of your note of the 26th ultimo, in which, under instructions from the Earl of Derby, you made inquiries concerning the condition and location of stores or provisions sent to Greenland by this Government for the relief of the "Polaris" Expedition, and whether the Polar expedition to be despatched by Her Majesty's Government in 1875 may consider them available for use, and requesting, in that event, to be furnished with a list of all such stores and provisions.

I have the honor to inclose, in reply to your inquiries, and in compliance with your request, a copy of a letter of the 19th instant, and of its accompaniments, from the Secretary of the Navy on the subject.

Accept, &c.,

(Signed) HAMILTON FISH.

The Right Honorable Sir E. THORNTON, K. C. B., &c.

NAVY DEPARTMENT,
Washington, January 19, 1875.

Letter. Sec. of the Navy.

SIR: I have the honor to acknowledge the receipt of your communication of the 29th December last, and the copy of the note of the 26th of December from the British Minister, making certain inquiries concerning the stores or provisions which were sent out by the United States Government for the relief of the "Polaris" Expedition. I beg leave to state that it is not practicable to furnish an exact inventory of stores, &c., left by the "Polaris" Expedition on the west coast of Greenland, but I inclose such information as is in the possession of this Department, with an approximate list of articles *cached* or otherwise secured or deposited, and a description of the localities in which they were left.

All or any of these stores are at the service of the Polar Expedition to be dispatched in 1875 by Her Majesty's Government, and in the event of their use the Department will accept such inventory and appraisement as may be made by the order of the commander of the expedition. If the *pendulum* should be recovered at Life-Boat Cove, the Department hopes that it may be practicable to use it in connection with such observations as may be made by the British Expedition with its own instrument. On the return of the expedition, the Department will be gratified to receive the pendulum, and also any other instruments, and such arms, implements, and books as may have been recovered. The Department takes this occasion to express its most cordial wishes for the success of the British Expedition of 1875 toward the North Pole by way of Smith's Sound.

I am, &c.,
(Signed) GEO. M. ROBESON.
Secretary of the Navy.

The Hon. HAMILTON FISH,
Secretary of State.

UNITED STATES NAVAL OBSERVATORY,
Washington, D. C., January 9, 1875.

SIR: In answer to your inquiries concerning the stores and provisions deposited on the west coast of Greenland by the "Polaris" Expedition, I have the honor to submit the following report:

There were three different deposits made: one on Cape Sumner, another at Thank-God Harbor, and the third near Life-Boat Cove.

Two crews left their boats, one a whale-boat twenty-four feet long, and the other the "Heggleman," canvas boat, on Cape Sumner, at the southern entrance of Newman's Bay, in latitude 81° 51′ N., and traveled on foot over the land to the ship. No list was made of the articles se-

Letter. R. W. D. Bryan.

cured with the boats.* The following is a complete list of what each boat took from the ship:

Provisions, &c., for whale-boat.

135 pounds pemmican.
192 pounds preserved meats.
23 pounds tripe.
76 pounds Polar cake.
24 pounds ham.
31 pounds molasses.
200 pounds bread.
30 pounds chocolate.
22 pounds coffee.
50 pounds oatmeal.
36 pounds sugar.
20 pounds cheese.
1 saw.
3 files.
6 sheath-knives.
Lead, canvas, and tacks for boat-mending.
1 dozen spare goggles.
1 spare oar.
6 pans, spoons, and pots.
1 small copper stove.
2 stove-kettles.
2 spare roullaum (?).
5 Sharps' rifles.
1 shot-gun.
2,500 fathoms of sounding-line.
1 patent log.
1 bag of shot.
3 pounds of powder.
12 cans of milk.
100 boxes of sardines.
400 cartridges (Sharps' rifle).
100 cartridges, center-fire (Navy pistol).
1 grapnel.
2 whale-irons.
2 lances.
25 fathoms spare lance-warp.
1 spare set of rudder-pindles (?).
6 sleeping-bags.
1 tent.
1 boat-cover.
2 rubber blankets.
1 box chronometer.
2 artificial horizons.
1 thermometer-case.
1 sextant-stand.
1 boat-sled.
1 fog-horn.
1 ball spun-yarn.
6 briar pipes.
4 jack-knives.
6 copper cylinders (for deposits).
2 telescopes.
1 pair of field-glasses.
1 apparatus for sounding.
Alcohol for specimens.
Blotting-paper for plants.

Provisions, &c., for "Heggleman" boat.

134 pounds bread.
90 pounds pemmican.
18 pounds coffee.
20 pounds oatmeal.
2 cases preserved meats.
2 gallons molasses.
6 pans, spoons, and pots.
8 briar pipes.
6 sheath-knives.
5 rubber blankets.
5 spare goggles.

* A few cases of preserved meat and a little bread, about 500 cartridges, one shot-gun, two rifles, one box chronometer,† two sextants.

† This chronometer, made by T. S. and J. D. Negus, of New York, after an exposure of four winters, was, in 1876, taken on board Her Majesty's steamship Discovery; in a letter dated December 14th, 1876, addressed to the Secretary of the Admiralty, and communicated to the Navy Department, Captain Nares says that the chronometer "has kept excellent time since its recovery." March 30, 1877.

Letter. R. W. D. Bryan.

The above list for the canvas boat is, perhaps, not complete, though its supply was much less than that of the whale-boat.

The provisions taken by each boat were nearly, if not quite, all consumed, but as the men could not carry much weight away, we may conclude that a great part of the stores still remain.

The following is a complete list of the provisions and stores deposited in Thank-God Harbor, in latitude 80° 37′ N., longitude 61° 37′ W.:

3 barrels clear pork.
25 barrels Graham bread.
1 barrel molasses.
1 barrel vinegar.
½ barrel brown sugar.
1 barrel lime-juice.
1 barrel pea-beans.
1 barrel southern wheat.*
1 barrel rice.
2 tierces hams.
4 1/6 cases pemmican (1,500 lbs).
12 cases preserved meat.
1 chest black tea.
1 bag coffee (100 pounds).
2 cases wheaten grits.
1 case alcohol (10 gallons).
1 case brandy (1 dozen).
4 cases whisky.
2 cases oil clothing.
1 case men's stoga boots.
½ case men's kip shoes.
½ case leather gaiters.
1 case pea-coats.
2 dozen blue flannel overshirts.
2 dozen drawers.
1 dozen gray heavy undershirts.
1 dozen gray drawers.
2 dozen black silk handkerchiefs.
1 dozen blue Navy trousers.
2 dozen long woolen stockings.
2 dozen short socks.
2 dozen blue flannel undershirts.
2 dozen woolen mittens.
1 dozen woolen comforters.
1 dozen Russian caps.
½ dozen tarpaulin hats.
2 dozen white linen frocks.
3 half boxes Navy chewing tobacco.
1 box Danish tobacco.
2 boxes salt-water soap.
½ box Navy shaving soap.
3 pounds black linen thread.
3 pounds white linen thread.
1½ pounds black sewing-silk.
1½ pounds papers needles.
5 pounds woolen yarn.
1 case clay pipes.
3 dozen briar pipes.
3 dozen assorted knives.
1 dozen tin pots.
1 dozen assorted tin pans.
2 bolts No. 1 cotton canvas.
1 bolt Ravens duck.
1 section main-deck awning.
4 sewing and roping palms.
3 pounds flax sewing-twine.
3 pounds cotton.
2 pounds beeswax.
50 assorted sail-needles.

Ordnance stores.

4 short guns, with appurtenances complete.
4 Sharps' rifles.
1,000 cartridges (Remington rifle).
1,000 cartridges (ball and buck-shot).

* Some of this wheat was, in 1876, successfully grown on board H. M. S. Discovery.

Letter.
R. W. D. Bryan.

4 Remington rifles.
6 Navy pistols.
1 dozen leather belts.
½ dozen frogs.
½ dozen cartridge-boxes.
½ dozen caps.
10 bags shot (250 pounds).
20 pounds musket-powder.
50 pounds bar-lead.
½ dozen powder-flasks.
½ dozen shot-belts.
10,000 gun-caps.
10,000 cartridges (Sharps' rifle).
100 cartridges (Navy pistols).
6 shovels.
2 pickaxes and hoe combined.
1 dozen assorted files.
3 clay-hammers.
1 broad ax.
2 wood-axes.
feet lumber.
1 barrel jar.
¼ gross assorted fishing-hooks.
6 cod-lines (60 fathoms each).
3 coils halibut-line.

The observatory at Thank-God Harbor was left standing, filled with such articles as would be affected by the weather, and covered with a sail.

About 100 feet to the north of the observatory the remainder of the stores were deposited in a pile on the ground.

Near Life-Boat Cove the following articles were placed in a cache:

The pendulum.
The transit-instrument without its glasses.
Three box chronometers.
Two or three trunks containing the arctic library of the late Capt. C. F. Hall.

The house where the second winter was passed by a portion of the "Polaris" crew is in latitude 78° 23½′ N., longitude 73° 21′ W.

The deposit is about E.SE. from the house, and distant about one-quarter of a mile.

The Esquimaux know where it is, and if they have not disturbed it would readily lead one to it.

Aided by the records of the expedition and my own recollection, I have endeavored to answer your inquiries.

I have, &c.,

(Signed) R. W. D. BRYAN,
Astronomer to the late United States North Polar Expedition.

Rear-Admiral WILLIAM REYNOLDS,
Chief Bureau of Equipment and Recruiting,
Navy Department, Washington, D. C.

Letter.
E. Bessels.

SMITHSONIAN INSTITUTION,
Washington, D. C., January 13, 1875.

SIR: I have the honor to submit herewith a report, in accordance with instructions received, upon the stores deposited near Smith Sound during the late United States North Polar expedition.

I understand the Department is in possession of an invoice enumerating these stores, and, therefore, I beg leave merely to offer a few remarks with regard thereto.

The depôt left on the south shore of Newman's Bay cannot be relied upon, as it only consists of a very limited number of cans containing preserved meat, some hard bread, G. G., stowed in a whale-boat.

The latter might be found useful in case of emergency, though her bows are stove in, but as there are a package of tacks and some sheet-lead contained in her lockers, the damage can be easily repaired.

As far as I can remember, the following instruments are contained in the boat:

1 spirit boat-compass.
1 patent log.
1 box chronometer.
2 sextants.

Near the whale-boat our canvas boat will be found, under a pile of stores, but most likely it will not be of any value, as it was already useless some three years ago. A small sledge leaning against the stone-pile can be used to mount the whale-boat. Most likely the stores left at Thank-God Harbor will be found in good condition, as it is not probable that they have been disturbed by bears, for we never saw any of these animals in the immediate vicinity of our first winter-quarters. Some of the stores could not be *cached* properly, as the beach consists of shingle only, which could not be penetrated to a greater depth than about two feet owing to the frozen condition of the subsoil. The observatory, however, contains such stores as would have been injured by exposure to atmospheric influence. These will probably be found serviceable, as this building was carefully closed and fastened to the soil by means of the diverging arms of the transit-stand T, whereby the danger of its being blown over would be to a great extent obviated.

No provisions were left at Life-Boat Cove, but a cache will be found at that locality (highest point of Lyttleton Island, N. 343° E. and N. 120° 5′ E., tangent to Cape Maryaling) containing several boxes of books and instruments, among the latter a pendulum, which served to make our determinations of force of gravity.

I would respectfully suggest that in case the English expedition should land at Life-Boat Cove they take with them, if possible, this pendulum, for the following reasons:

Letters. E. Bessels. Sec. of Admiralty.

1. A simultaneous comparison of this instrument with that which will be employed by them would greatly enhance the value of their own as well as of our observations.

2. They would then be able to compare, probably at one point, two pendulums that have both been used extensively in different latitudes.

I am, &c.,

(Signed) EMIL BESSELS,

Chief of the Scientific Department of Late Arctic Expedition.

Admiral WILLIAM REYNOLDS.

SECRETARY OF ADMIRALTY TO UNDER SECRETARY OF STATE, FOREIGN OFFICE.

ADMIRALTY, *February* 18, 1875.

SIR: With reference to your letter of the 9th instant, forwarding the reply of the United States Government to the application made to them in regard to the stores of the "Polaris Expedition," deposited on the west coast of Greenland, I am commanded by my Lords Commissioners of the Admiralty to request that you will move the Secretary of State for Foreign Affairs to instruct Her Majesty's minister at Washington to convey the thanks of Her Majesty's Government to that of the United States for the liberal manner in which they have placed the stores in question at the disposal of the Arctic Expedition, and for their good wishes for the success of the undertaking.

I am, &c.,

(Signed) ROBERT HALL.

The UNDER SECRETARY OF STATE, &c.,

Foreign Office.

III.

JOURNALS

OF

MR. H. C. CHESTER AND CAPTAIN GEO. E. TYSON

WHILE

ON BOAT-JOURNEYS, JUNE–JULY, 1872.

III.

JOURNALS OF BOAT-JOURNEYS.

MR. CHESTER'S JOURNAL [CONDENSED BY R. W. D. BRYAN.]

June 13.—At 11.40 a. m. start from Cape Lupton. After two stops haul up on the land-ice at 5.15 p. m., having made a distance of 2½ miles. Canvas boat leaks badly. **1872.**

June 14.—Ice opened at 2.20 p. m., when the start was made. At 4 p. m., ice closing, were obliged to pull up on a piece of drifting ice. Ther., 32°.6 F.

June 15.—At 6.40 a. m. left the old floe and worked our way out through the small ice into the open water. During our stay on the old floe we were drifted 4½ miles to the south, but we are now in clear water. Though we have a fresh head-wind we make very good headway with our canvas boat. In pulling up along the land saw large quantities of dovekies sporting in the water, a few eider-ducks, several ivory-gulls, and a few seals. At 8 p. m. landed on the ice-floe at the mouth of Newman's Bay. The distance pulled during the day, 23 miles.

June 16.—Not a particle of open water to be seen. Mr. Meyer taking bearings and sketching the land. Our boat-camp is about 3 miles to the N. and W. of Cape Sumner.

June 17.—SW. wind driving pack north. Channel still blocked up with ice. Latitude observed, 81° 55′ 45″ N. Ther., 35° F.

June 18 *and* 19.—SW. wind; ice moving north, at times at the rate of two miles per hour. Ther., 32°.6 F. to 36° F.

June 20 *and* 21.—Fresh breeze from the north. Ice moving south one and a half to two miles per hour.

June 22.—Open water abreast of camp and toward the south; ice to the north. The furthest point of land seen on west side of the channel bears N. ½ W. true from our boat-camp, and is from 50 to 60 miles distant. In a direction one point clear of that cape, from our camp, something has the appearance of land and pronounced so by all hands, but it is a long distance off. Ther., 30°.3 F.

June 23.—At 7 a. m. launched boat and pulled up about two and a half miles to the NE., along the edge of the floe. Meeting the pack coming down rapidly and grinding along on the edge of the floe, we were

1872. obliged to fleet back a little, and soon hurried our boat and things out on the floe again. Two of the boat's crew, Siemens and Kruger, went to the land, north side of the bay, near Cape Brevoort, to look for musk-ox. They returned to the camp at 9.30 p. m.; saw no game; ascended one of the mountains bordering the straits; had a good view to the north, and could see no open water in that direction. Ther., 32°.8 F. to 30°.8 F.

June 24.—The keen wind makes it rather cold; our tent is constructed from the Hegglemann boat turned up on the side, with rubber blankets stretched in front. It makes us quite a shelter. We have no fuel for cooking-purposes. This evening the boys got up a little hot coffee by the burning up of an old pair of condemned boots. Ther., 30°.2 F. to 31°.8 F.

June 25 *and* 26.—Wind north; ice moving south.

June 27.—Siemens and Kruger volunteered to go overland to the ship to bring up a supply of bread. We have been detained here so long that I am afraid when we do have a chance to proceed that we shall be short of bread. We have sufficient meat to last us till the first of September.

June 28.—At 2 a. m. the pack, which is driving down the channel rapidly, began to grind pretty hard on the edge of the floe, breaking and piling up the ice in all manner of shapes, and causing us to fleet back on the old floe with our boat and provisions some two or three hundred yards.

June 29.—Wind N.; pack moving south. At 5 p. m. shut down thick fog.

June 30, 2 30 a. m.—Hans arrived with a note from Captain Budington. At 3 p. m. Mr. Meyer left the camp to go to the land on the north side of Newman's Bay to survey.

July 1.—Breeze from N.; ice moving S. Mr. Meyer returned from his trip to the land at 6 p. m. (He had traveled as far north as the shore of Repulse Harbor, and observed a midnight altitude of the sun, which gave the latitude of 82° 7′ N.)

July 2.—Mr. Meyer is a little snow-blind to-day from his walk yesterday over the ice without wearing glasses.

July 3.—The character of the ice has been about one thing ever since we have been here—small ice jammed up into innumerable hummocks and assuming all manner of shapes and forms. Occasionally an old flat floe seen among it as it moves down the channel.

July 4.—At 5 a. m., Siemens and Kruger arrived at the camp from the ship. They had been 39 hours on the trip up. Part of the way they dragged the articles that they brought on a small sled, but it broke down and they were obliged to abandon it, and the rest of the

way the bread and the other small articles were brought on their shoulders. 1872.

July 5.—Wind north; ice moving south; a few lanes of water at times.

July 8.—Light rain and snow; fog. The wet weather confines us under our canvas boat all this day. I am waiting in hopes that the ice might soon open in the channel, either to let us to the ship with the boat, or across the channel. If we could be fortunate enough to cross the channel, I am confident we could reach a high latitude overland, but I am afraid the ice won't admit of our doing that. The only alternative is to go back to the ship without having accomplished anything, and if the vessel escape destruction at Thank-God Harbor, put south as soon as an opportunity permits.

July 10.—In the afternoon the pack began to slack up from the edge of the floe, leaving a narrow strip of water. At 5 p. m., started south with boat; advanced about two miles; the pack closing in, landed on the floe again; now waiting for a chance to get to the ship with the boat.

July 11.—Calms and clear weather; no open water; ice moving south.

July 12.—Light wind, SW.; pack moved N. for a few hours.

July 13.—Wind SW.; ice moving N. Poor prospects for getting down with our boat very soon. At 1 p. m. started to sled our boat in to the land near Cape Sumner, south shore of Newman's Bay. As we advanced toward the shore the wind blew in heavy squalls off the land. Getting within one mile of the shore, we were obliged to leave our boat on the ice, and travel in with our clothing, all hands becoming wet through, going through deep pools of water.

July 14.—At 1 a. m. landed on the shore. Soon got into the tent near Tyson's boat and put dry clothing on; heavy squalls blowing down the mountains. A short time after we landed the boat was picked up by a heavy squall of wind, was carried a short distance, and a hole was stove in her. Our tent blew down, and we were unable to erect it again; then we had to fleet to the boat, putting in all the heavy goods to hold her down, and getting into her ourselves secured a shelter. The gale continued to blow, with unabated fury, all through the day, with occasional rain-squalls. In the evening, unable to stop in the boat any longer, lashed her down with ropes and stones, took our tent up near a bluff, where we found a lee, and erected it.

July 15.—Gale SW., with rain.

July 16.—Light winds N.; cloudy weather; 8 a. m., fresh breeze SW. A narrow band of water between the shore and ice prevents us from reaching our boat and getting her on shore. At 11.30 a. m. two of my boat's crew, Jamka and Kruger, started for the ship over the

1872. land. At 2 p. m. Mr. Meyer followed them, myself and Hermann Siemens stopping here for the purpose of drying up the wet clothing, and of getting our boat ashore, which we shall do the first opportunity.

July 17.—Light winds, with snow. In the afternoon managed to get out to our boat, on the ice, and at 7 p. m. had our boat secured ashore. Picked up several pieces of drift-wood on the beach, some pieces 18 or 20 inches in length, and from 1 to 4 in diameter; one piece still retained the bark on it.

July 18.—Breeze SW.; rain.

July 19.—Light winds and calm; snow. Latitude, from midnight meridian altitude of sun, 81° 51′ 23″ N.

July 20.—Light winds and rain.

July 21.—Fresh breeze SW.; clear. We have been drying clothing on the rocks. Hermann Siemens brought up an armful of drift-wood from the beach, the largest piece about 4½ inches in diameter and about 18 inches long.

July 22.—Packed up the goods snug in the tent. Placed a quantity of stones on the canvas around the tent to prevent its blowing down. At 2 p. m., with a small bag of clothing and our box-chronometer, started overland to the ship. After reaching the top of the mountains, that we had to cross, the only open water that could be seen in the channel was a narrow strip near the north cape, on the west side of the channel. At midnight we were walking down the plain near the ship.

CAPTAIN TYSON'S JOURNAL [CONDENSED BY R. W. D. BRYAN].

June 10.—At 2.40 p. m., we left Cape Lupton withthe boat. Strong breeze from the southwest. Arrived at Newman's Bay at 10 p. m. The ice was closing very fast. We hauled the boat on the ice and encamped. It is very dangerous navigation, and in a distance of twenty miles I have not found one spot fit to haul a boat on. 10.30 p. m., no water, the ice having closed again.

June 11.—Blowing strong from southwest, thick and foggy, and no water visible.

June 12.—The storm continues; ice setting to the north very fast. Noon, very little wind; the ice close and compact, very rough and hummocky. Thermometer, 34° F.

June 13.—Light wind from southwest; the ice setting south at the rate of one mile per hour. I cannot do anything toward getting ahead until a change of wind or perhaps a calm.

June 14.—Light variable winds, fog and light rains; ice moving south. Saw three burgomeister-gulls, brent-geese, and a few dovekies.

June 15.—Cold, cloudy, foggy. Ther., 30° F. 2 p. m., there is considerable water now along the mouth of Newman's Bay, but before I

start with a loaded boat I must see how far it extends. So, taking the boat without its load, I pull north about two and a half miles toward the north cape of the bay, and there finding the ice hard upon the shore, I returned to the camp. I should like very much to get to the land, where the men would be more comfortable, for, encamping on the ice, we have wet feet and wet clothes continually. Mr. Chester, with the canvas boat, arrived at 8.10 p. m. 1872

June 16.—Light breeze from the west. Ice drifting south; no chance to get ahead. Saw several eider-ducks and ivory and burgomeister gulls.

June 17.—Blowing strong southwest. Ice setting north; very close and compact. Nothing but hummocks, so that you cannot get a boat on and drift with it; ther., 33° F.

June 18–21.—Very stormy; ice close, moving north or south, as acted upon by the wind; at times rain and sleet. Ther., 26°.8 to 33° F.

June 22.—Ther., 30°.4 F. There is considerable water abreast of Newman's Bay and along the shore to the southward, but to the north the ice is close and compact, drifting south until it meets the current coming out of Newman's Bay; it then turns to the westward, leaving quite a space of water.

June 23.—Morning fine and pleasant. Considerable water abreast of Newman's Bay. Started with the boats in hopes of reaching Cape Brevoort, got two and a half miles, found the ice hard upon the shore and coming south very fast.

June 24.—Blowing strong from the northeast. Snow-squalls. Ice setting south all day. It looks dark and watery to the north and northeast. Barometer rising, 29.67; ther., 30° F.

June 25.—Could I get my boat on shore, I should take the land and travel along the coast as far as I could; but I cannot get there. The floe abreast of Newman's Bay extends as far as you can see along the land to the north, and is about one mile from it in the narrowest part. It is piled high with hummocks. In fact, there is scarcely a place to haul the boat either on land or ice, and, if I save it, I shall consider myself fortunate. I cannot land on the south side, because there the land is perpendicular. I want to get on the north side, for then I can take the ravines and travel along just inside the coast, and at least get to 83° N., or thereabout.

June 26.—Strong breeze from the northeast; foggy; ice drifting south. No chance to get ahead. Saw a flock of eider-ducks, male and female. Bar., 29.84; ther., 30° F.

June 27.—Ther., 27°.3 F.; bar., 29.64. There is quite a body of open water abreast of the camp, and to the north, it looks dark and heavy. There is quite a sea running, and I have moved my camp further in on

1872. a large, heavy piece of ice. It is quite thick, and I cannot see beyond three or four miles. A large body of ice has passed us during the last seven days, drifting at the rate of from one to three miles per hour.

June 28.—Still blowing strong from the northeast. This morning, at 2 a. m., we were startled at hearing the ice crushing. Springing from our tent, we discovered that our old encamping place had been destroyed by a large floe. The floe kept crushing in until it approached within 40 yards of our present encampment. There it first stopped in its destructive progress, and then finally started on its journey south. It apparently extends entirely across the straits, and as far north as you can see. I should think it comes from the head of the bay, for a bay we will surely find it, should we be fortunate enough to get a few degrees further north. It was fortunate I removed the tent further back yesterday morning. Had I been in the old place, we should have lost everything, and probably our lives, as the ice came in so quickly as to give us no chance to escape. I have now a watch set, who will give warning when these large floes are approaching. 4 p. m., ther., 30° F.; bar., 29.74.

June 29.—Light breeze from the north. Ther., 30° F.; bar., 29.73. I have removed my camp further in on a large piece of floe-ice, where my former (first?) camp was pitched. The ice was not very strong, and these large floes come drifting down with wind and tide, crushing everything in their way but the land, and on that they leave their marks.

June 30.—At 2 a. m. we were surprised by a visit from Hans. Captain Budington writes to Mr. Chester to return as soon as possible with both boats, as the ship is in a condition that requires our aid. We cannot get down as yet, but will go as soon as possible. Hans starts at 2 p. m. on his return to the vessel, accompanied by Dr. Bessels. Midnight, ther., 32°.5 F.; bar., 29.82.

July 1.—Strong breeze from the north. Ice setting south. No chance to get either to the north or to the vessel. Ther., 32° F.; bar., 29.75.

July 2.—Strong breeze from the north. Ice setting south. Ther., 30°.7 F.; bar., 29.55. Midnight, ice setting north, against a strong northeast wind.

July 3.—Wind from the north; thick fog. Bar., 29.52.; ther., 32°.5 F. The ice close and compact, with no movement. It is impossible to get to the ship or to the land. A good deal of the ice consists of large, heavy, hummocky, and very rough floes, showing the signs of great pressure while the ice was forming and yet young. 7 p. m., ther., 34° F.; barometer has been as low as 29.45, but is now rapidly rising. The land is almost entirely bare of snow, showing that it is much warmer there than we experience here on the floe.

July 4.—Blowing strong from the north. Ice setting south. There is no open water. Kruger and Siemens arrived from ship with provis-

ions and a letter for Mr. Chester, but none for myself. The contents of Mr. Chester's letter I do not know, but Kruger gives me all the information I desire. Captain Budington wants us to return immediately, but we cannot get there at present on account of the ice, which keeps us completely blocked up. I shall return as soon as I possibly can. I have given up the doctor, who, I suppose, will not return to the boats. There is a thick fog hanging over the land. Barometer at noon, 29.30, but is gradually rising. 4 p. m., thick and foggy, with a strong breeze from N.NE. Under the fog to the north it looks white, showing that there are large quantities of ice in that direction. Ther., 32° F. **1872.**

July 5.—I started this morning to haul my boat in to the land with the help of Mr. Chester's crew, and after a tedious haul of eight hours reached the land with her. Got back to my tent at midnight.

July 6.—Started at 1 a. m. with tent, clothing, and sleeping-gear. About the time I started a thick fog came on, the wind being northerly. There was, on some places of the floe, so much water that it was frequently impossible to clear it during the fog; concluded therefore to encamp. At noon we again took up our work, and reached the land (near Cape Sumner) at 6 p. m. For two days now we have had no dry clothing on, but this evening we change our clothing and turn into our blankets, tired men. After a good rest, I intend to start for the ship. I have been here almost a month, and there is no change in the prospect. Captain Budington is calling for help, and, as I cannot get to him by water, I must go by land. At midnight, one of the men, Hobby, left for the vessel.

July 7.—Left for the vessel at about 3 p. m.

IV.

JOURNALS

USED IN THE

PREPARATION OF THE NARRATIVE OF THE POLARIS EXPEDITION.

IV.

JOURNALS AND LOG.

List of journals.

The following journals were furnished by the Navy Department:

Capt. C. F. Hall's journals during his first expedition, 1860-'62, together with all the observations, surveys, and sketches made by him: during his second expedition, 1864-'69—never published*—the complete work of his five years' labor among the Esquimaux: a copy of the notes kept by Hall while on his last sledge-journey, from October 10, 1871, to October 24, 1871—the property of Mr. H. C. Chester.

The log-book of the Polaris, written by Mr. H. C. Chester, and containing daily records without interruption from June 10, 1871, to June 23, 1873, with a few entries at subsequent dates.

Captain Budington's journal, written by J. B. Mauch, under the supervision of Capt. S. O. Budington; from October 10, 1871, to June 26, 1873.

R. W. D. Bryan's journal, in two books: 1st. From October 15, 1872, to June 23, 1873. 2d. From June 3, 1873, to November 15, 1873, with subsequent entries up to February 27, 1874.

William Morton's journal, ten entries from July 27, 1871, to February 28, 1872; published in the Hon. Secretary of the Navy's report for 1873.

J. B. Mauch's journal, in two books, from June 29, 1871, to May 29, 1873;—in torn books, from January 21, 1872, to June 7, 1872; from July 8, 1872, to July 29, 1872; from August 29, 1872, to October 14, 1872.

Hermann Siemen's journal, in two books, 1st. From June 29, 1871, to October 12, 1872—published in the Hon. Secretary of the Navy's report for 1873. 2d. From October 12, 1872, to June 25, 1873—in German;—translated and used.

Henry Hobby's journal—in German.

*By a Resolution introduced into the United States Senate February 6, 1877, by Hon. A. A. Sargent, the Secretary of the Navy was called upon to furnish, through the Superintendent of the Naval Observatory, a Narrative of this second expedition of Captain Hall. By order of the Secretary of the Navy of February 17, in consequence of the failing health of Admiral Davis, Superintendent, Prof. J. E. Nourse, U. S. N., was directed to take charge of the preparation of this Narrative.

List of journals.

Captain Tyson's journal, in six books, from October 15, 1872, to May 16, 1873. These books were furnished by Capt. G. E. Tyson for the Arctic exhibit at the International Exhibition in Philadelphia, and were merely referred to in the preparation of this Narrative.

Frederick Meyer's journal, from October 15, 1872, to April 30, 1873—original not furnished—published in the Hon. Secretary of the Navy's report for 1873.

John Herron's journal, from October 15, 1872, to May 11, 1873; published in the Hon. Secretary of the Navy's report for 1873.

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